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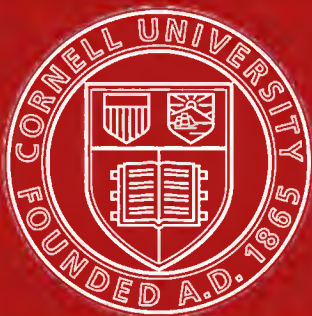
Educational courses in study and reading



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EDUCATIONAL COURSES
IN STUDY AND READING

APPLETONS'
UNIVERSAL CYCLOPÆDIA
AND ATLAS

THE CYCLOPÆDIA—ITS USES AND NECESSITY

THE uses and necessity of the Cyclopædia are, in general, to enlarge the extent or scope of our knowledge and to deepen or intensify and to make richer its content. This view of the use of a cyclopædia should appeal to every person, according to his mental development and the time at his disposal for obtaining knowledge.

As a simple reference work to explain, to clarify, to enlarge a subject, and to set aright one's suppositions and guesses, APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is *the instrument* for this purpose.

To enable its readers to trace out, to hunt down, and exhaustively follow out any line of knowledge for practical or theoretical purposes is another function of this Cyclopædia. Through such use one soon possesses a broader and more comprehensive knowledge of the original topic. He sees now its relations to other subjects, and discovers its relative importance in the particular department of knowledge to which it belongs. He learns to discriminate between essentials and minor elements of knowledge.

To learn in what direction and to what extent any line of thought, any application of a principle or of a science, has been utilized for practical purposes in the arts, in business, or in the professions, is another field of usefulness to the possessor of the UNIVERSAL CYCLOPÆDIA AND ATLAS. Much time, money, and energy have been wasted in vagaries, in threshing over mere straw, when well-digested knowledge of the subject as exhibited in this Cyclopædia would have prevented this waste.

The benefits of an habitual use of the UNIVERSAL CYCLOPÆDIA AND ATLAS become apparent in a broadened mind, wider and deeper knowledge on every subject investigated, skill in discriminating between essentials and non-essentials, the development and strengthening of a logical memory—power to grasp the larger concerns of life, and to minify the really useless ones.

Without question, the proper use of APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS will result in all the benefits here stated.

Where, then, should the Cyclopædia find a place? The reply is brief—in every home, in every office, in every school, in every library.

INTRODUCTION

THE purpose of this book is definitely indicated by its title, Educational Courses in Study and Reading.

Herein will be found logically classified not only the grand divisions of all departments of knowledge treated in the Universal Cyclopædia and Atlas, but an exhaustive subdivision of these grand divisions, including lists of topics so arranged as to give the reader and the student a systematic guide in the use of this Cyclopædia.

Most persons consider a Cyclopædia simply a reference work. For such, its use is largely limited to that class of subject-matter in which, by education, occupation, or profession, its readers take a special interest.

While the entire circle of human knowledge lies within the volumes of the Universal Cyclopædia and Atlas, few readers have a true conception of its extent and richness as a library, since, like the dictionary, its topics are treated alphabetically rather than in logically arranged courses for reading or study.

It is believed that this volume brings out distinctly the nature and relative place of every important topic treated in the Cyclopædia, and that through the use of the Guide readers and students may be led to pursue complete courses in various departments of knowledge.

Occasionally the same topic will be found classified under two different subdivisions for the purpose of further elucidating or completing the range of subject-matter thus classified.

The Contents at once designates the character, extent, and location in the book of the main divisions and subdivisions of subject-matter classified, which is as follows:

1. MATHEMATICS, PHYSICAL SCIENCES, AND DESCRIPTIVE GEOGRAPHY.
2. THE BIOLOGICAL SCIENCES, ZOOLOGY, AND BOTANY.
3. LANGUAGES AND LITERATURES OF ALL NATIONS.
4. MYTHOLOGY, HISTORY, CIVICS, AND POLITICS.
5. HISTORY, CIVICS, AND POLITICS.
6. ECONOMICS, INCLUDING SOCIOLOGY, TRADE, FINANCE, AND POLITICAL ECONOMY.
7. THE MANUAL AND INDUSTRIAL ARTS, MANUFACTURES, AND APPLIED SCIENCE.
8. THE FINE ARTS.
9. GAMES, SPORTS, DRESS, AND CUSTOMS.
10. MEDICINE AND SURGERY.
11. LAW.
12. EDUCATION AND PEDAGOGICS.
13. PHILOSOPHY AND ETHICS.
14. THEOLOGY, RELIGION, AND CHURCH HISTORY.

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METHOD

IN THE USE OF APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS WITH "EDUCATIONAL COURSES IN STUDY AND READING"

THE main objects of the "EDUCATIONAL COURSES" are, first, to exhibit the grand divisions of learning, together with such of their subdivisions as shall clearly fix the place and relation of any cyclopædia article; secondly, to designate the extent of subject-matter treated under any subdivision, and the proper order in which the cyclopædia articles should be read or studied when the reader is pursuing any of the educational courses. The value of this arrangement to those who habitually use the "Educational Courses" will be a saving of time in acquiring a comprehensive knowledge of a principal subject, and a constant training of the analytical faculty.

Too much can not be said against the injurious and mind-weakening effects of the customary method of reading newspapers, magazines, and the popular books of the day. Waiving criticism of the quality or quantity of the literature composing the daily intellectual menu spread before the reading public, the utter lack of a rational method of reading, the almost criminal waste of time, and the resulting effect of an indigestible, orderless mental stuffing, are everywhere in evidence.

One effective remedy to offset the evil results of a slipshod, haphazard, omnivorous reading habit may be found in the complete mastery and use of the analytical method, which enables the reader, after sufficient practice, to discriminate in the subject-matter he reads, and easily to retain and assimilate the knowledge embodied in the article or group of related topics read.

The essentials of this method consist in the constant practice—until unconsciously this mode of reading is always employed—of seeing with analytic mental vision the principal and subordinate thoughts of an article in their correct relation.

The employment of this method is a constant training of the reader's analytic powers, including the power to observe closely and to classify logically. It is, further, a valuable training of memory and judgment and a great economy of the reader's time, enabling him to accomplish tenfold the usual results.

The details of the analytical method of reading the subject-matter of APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS, as arranged in the "Educational Courses," are here presented.

The materials required are APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS, a copy of the "Educational Courses," and a note-book for practice in analysis.

As to the best time to learn the method, whenever even five minutes of consecutive thought can be given for this purpose, it should be used. Daily practice, however, from ten minutes to an hour, if possible, will soon bring most valuable results.

At first there should be abundant practice in the analytical reading of simply and briefly treated topics, then of those gradually increasing in complexity and length. The reader should not make any effort to remember the analysis he makes, the object at this time being to develop and train his power to analyze an entire topic.

As a rule, topics consisting of but one paragraph should first be taken for analysis; the note-book should be employed, and a definite system of notation, or symbols, for the principal and subordinate topics should be used; this system will be found easy to employ:

- I. First principal division of the article.
 - 1. First important subdivision of the article.
 - a. First division of the preceding article.
 - (1) First division of the preceding article.
 - (a) First division of the preceding article.

ILLUSTRATIONS OF ANALYSES OF SIMPLE ARTICLES

CUSTOMS. "*Coronation*," vol. iii, p. 199.

- I. Introduction :
 1. Derivation of the word.
 2. First and second definitions.
- II. Placing of the crown on the sovereign's head :
 1. Who performs this service.
 2. Different customs in different countries.
- III. Antiquity of coronation ceremonies.
- IV. Important features of the ceremony :
 1. Anointing.
 2. Coronation oath.
- V. Oath of :
 1. Accession as a monarch.
 2. Coronation.
 3. Ceremony of coronation not necessary to the authority of a monarch.

PHYSICS. "*Density*," vol. iii, p. 402.

- I. Introduction :
 1. Derivation of the term.
 2. Definition in physics.
 3. "Absolute density."
- II. Definition of mass ; how measured.
- III. Relation of density of bodies to their masses and volumes.
- IV. Terms in which density is expressed.
- V. Standards of density of solids and liquids.
- VI. Standards of density of gases and terms synonymously used.

MANUFACTURES. "*Lamps*," vol. vii, p. 35.

- A. *Historical* :
 - I. Introduction.
 1. Derivation.
 2. Definition as a contrivance.
 - II. Simplest form of lamp, two kinds :
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 2. Historical lamps of each kind.
 - III. Bronze lamps of Etruscan make :
 1. Form, ornamentation, wicks, etc.
 2. The Museum of Cortona lamps.
 3. Bronze lamps from Pompeii and Naples.
 4. Lamps of the ancient Romans—the candelabrum.
 5. Imperfections of the lamps of the ancients.
- B. *Modern lamps using a burning liquid* :
 - I. Principal features in improvements.
 - II. Use of petroleum.
 - III. Invention of the chimney.
 - IV. Other devices.
- C. *Other lamps* :
 - I. Drummond's lamp.
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 1. Arc.
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For practice, it is recommended that the reader, at first, select for analyses short articles in every grand division and subdivision of the lists contained in the "Educational Courses."

Whether he uses the Cyclopædia simply as a reference work, or, in addition to this, uses it for systematic study of a subject, the reader who becomes proficient in the analytical method of reading is, in any case, furnished with the most powerful mental instrument.

He will then be able not only to select at a glance the subject in which he is interested, but to determine its value as an element of knowledge; to obtain from the article its essential facts, thoughts, or arguments, and to enrich, or perhaps modify, his similar concepts.

The use of the note-book is to assist the reader in making his analysis of articles systematic and complete.

A few principles of analysis are as follow :

1. The title of the cyclopædia article embodies the sum total of all the facts, illustrations, arguments, and conclusions contained in the article, the several paragraphs of which form an exposition of that particular subject. The entire body of the article is the unit to be analyzed.

2. Long cyclopædia articles are frequently summarized by a word, phrase, or sentence representing the thought of the paragraph following; the paragraphs themselves are sometimes partially analyzed. In these cases the analysis is already partly performed for the reader.

3. The title of the cyclopædia article treated is the primary unit; the first subdivisions of this primary unit will consist of as many parts as there are paragraphs, if the article has been written properly; the second subdivision will be a division of each paragraph, and will consist of as many parts as there are complete sentences in the paragraph analyzed; care must be taken in determining which are the main and which the subordinate elements in the analysis to be made.

4. In many instances the first (or I) subdivision of an article, when analyzed, will stand thus :

I. Introduction :

1. Derivation of the term.
2. Definition of the term.
3. Illustration of the term.

a.

b.

c.

5. Some cyclopædia articles are so extended that their analyses will be made thus :

A.

I.

a.

(1)

(a)

6. Daily practice in note-book analysis of cyclopædia articles will, in time, beget in the reader the habit of rapid analysis of well-written brief articles, without the assistance of pencil and paper, until such analysis becomes unconsciously a habit. When the reader reaches this stage of ability, his reading is synonymous with his mastery of the article read; his memory will have been trained to an extent heretofore never realized; indeed, every power of his mind will have been strengthened.

7. The best analyses are those whose main divisions and subdivisions are expressed in their titles by a word, a phrase, or a short sentence, and whose synthesis or recomposition approximates the original article.

Because facility in written or mental analyses of articles is the result of much labor, the reader unaccustomed to such analyses should not expect perfection after a few trials, but should persevere, remembering that the reward is sure. No better literature than APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS exists for such training of analytic power, the end of which is the ability to concentrate the mind and to retain in their due proportion all the thoughts expressed in the printed page.

EDUCATIONAL COURSES IN STUDY AND READING THE UNIVERSAL CYCLOPÆDIA AND ATLAS

CHAPTER I

MATHEMATICS, PHYSICAL SCIENCES, AND DESCRIPTIVE GEOGRAPHY

DIVISION A.—MATHEMATICS

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

"MATHEMATICS is the science which reasons about the relations of magnitudes and numbers, considered simply as quantities admitting of increase, decrease, and comparison."

Increasing, decreasing, and comparing the sizes and shapes of objects and their number are among the early manifestations of the intellectual powers in man, but the ability to express or interpret mathematical operations and relations by means of technical symbols is by no means uniform. Some persons, like Blaise Pascal, who at the age of twelve rediscovered by himself the theorems of elementary geometry, early show mathematical ability of the highest order and continue to increase in this power as they advance in years; others make but little progress in the science, however persevering in its study.

In its more advanced and complex stages probably there are no loftier or more abstract concepts than those reached in mathematics, hence the wise remark of Bacon: "Mathematics makes men subtle."

But aside from its being one of the most perfect means for the cultivation of the deductive powers and discipline of a high order, mathematics, from simple arithmetical operations to the calculus, has an every-day practical use. To enumerate these uses would be difficult; to specify any class of persons who can entirely dispense with every form of mathematical knowledge would be still more difficult. From the simplest form of accounts to the derived formulas for the most complex motions of bodies and for the laws of mechanics, mathematics has constant application.

As it is an essential part of even an *elementary* education, no person should fail to acquaint himself to some extent with the principal branches of the science, to know something of the history of the great mathematical discoveries, to learn to interpret simple formulas and thereby see their extensive application in the applied sciences.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS presents in practical form the main features of mathematical science. It does not intend to be a substitute for a full series of textbooks on this science, but gives just that kind of knowledge needed by the school pupil, the mature student, the business or the professional man—in fact, by any intelligent reader seeking mathematical knowledge.

ILLUSTRATION OF TREATMENT OF MATHEMATICAL SUBJECTS

GEOMETRY

Four columns, revised by Dr. SIMON NEWCOMB, Professor of Mathematics and Astronomy in Johns Hopkins University.

- (1) Derivation and definition of the term; origin of the science.
- (2) How geometry is distinguished from the physical sciences; extended illustrations.
- (3) Nature and peculiarity of geometrical reasoning illustrated.
- (4) The metrical or Euclidean geometry, its fundamental idea; illustrations.
- (5) Graphic or projective geometry; its history; fundamental idea; illustrations.
- (6) Analytic geometry not a new kind of geometry, but a different method of studying geometry.
- (7) Non-Euclidean or hypergeometry, its nature; inconceivable character of its hypothesis, that space has more than three dimensions; the idea on which this geometry proceeds.
- (8) The famous Euclidean axiom of parallels under the non-Euclidean geometry.

(9) History of geometry, with accounts of all the noted geometers from Thales (637-548 B. C.) to nineteenth-century mathematics.

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On a careful investigation of the large list of mathematical topics in every branch of this science as treated in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS, it will be conceded that this cyclopædia contains just that presentation of mathematical knowledge which is useful in every-day life.

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DIVISION B.—**PHYSICS**

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

To child and man alike the external world, space, and all it contains, and all phenomena connected therewith, are in some degree interesting. This material world is a constant exhibition of marvels to those whose senses have once been awakened and trained to observe the visible creation.

These appearances, or phenomena, are the result of the constant action of energy, or force, upon matter. The science that investigates the material phenomena of the universe—that is, the science of matter and energy—is called *physics*.

In the development of science, physics excludes the study of organized bodies and the mineral world. It deals with force and matter, their relations, laws of action, and resulting phenomena.

Physics is almost, if not entirely, a fundamental science, and, as such, some knowledge of it is indispensable to all, whatever be their occupation or profession. In the several industrial arts, in the applied sciences, in machine construction and operation, in the various kinds of engineering, and in the intelligent explanation of constantly occurring physical phenomena, a knowledge of physics is of the highest importance.

Notwithstanding the great range of this science, its study may be grouped under two principal divisions, viz. :

First, mechanics, which treats of the nature of forces and their action on bodies according to their forms and conditions ; secondly, the classification and characteristics of the forces—gravitation, molecular forces, heat, light, electricity, and the four forms of kinetic energy dependent on them, viz. : bodies in motion, radiant heat and light, electricity in motion, and absorbed heat.

Recognizing the importance of a knowledge of physics, the question arises, Where shall one find a work on this subject, at once authoritative, replete with the latest investigations and discoveries, not too technical in phraseology for the reader to understand, and explaining every phase of this science?

THE BEST LIBRARY ON PHYSICS IS CONTAINED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS. In this Cyclopædia there are nearly four hundred and fifty separate topics on physics.

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MAGNETISM AND ELECTRICITY

The telegraph, the telephone, arc and incandescent lights, and the trolley-car have become such commonplaces in our every-day life that we accept them without remark as a part of our twentieth-century inheritance. Scores of other inventions based upon the nature and laws of magnetism and electricity and their mutual relations are every year appearing. We marvel at them, but, unless commercially or scientifically interested, usually pass them by with the comment, "Yes, this is the age of electricity indeed!"

But why should not every person who reads, who assumes to be intelligent regarding every-day topics, possess a wider and more definite knowledge of magnetism and electricity, when, at slight cost, the means are at hand? And especially why should not the person who desires to be thoroughly abreast of the times on this subject, or who would become an electrical expert—why should not such go to the fountain of information and authority on this matter, by pursuing a course of reading and study from the UNIVERSAL CYCLOPÆDIA AND ATLAS?

No one knows what magnetism and electricity really are. Their manifestations, mutual relations, and laws of action have been sufficiently observed to enable the present generation to make wonderful applications of them in the arts, and as obedient servants.

We write, talk, see, ride—indeed, do scores of acts through the applications of these subtle forces.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains one hundred separately treated articles on magnetism, frictional electricity, and dynamical (current) electricity. These articles thoroughly studied will equip the reader with an accurate and well-rounded knowledge of this branch of physics, which is now ranked perhaps first in importance as an applied science.

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To show the scope and thoroughness of treatment of the articles on Physics, an analysis of three topics is here presented :

MOTION

Derivation and definition of the term; conditions essential to a definite conception of motion; fundamental idea of a simple movement; kinematics defined; velocity defined; the three simple units used in investigating natural phenomena given and explained; what determines the elements of the motion of a point; uniform and uniformly varied motion; formula for velocity in terms of space and time and rate of variation of velocity; motions of *translation* and of *rotation* illustrated and explained; *relative* and *comparative* motions of points defined, illustrated, and compared; compositions of translations; resolutions and compositions of rotations: (*a*) rotation of a rigid body about a given axis explained; this proposition forms the basis of the construction of spur-gearings; (*b*) rotations resolved and compounded in another manner, giving the basis of construction of bevel wheels; (*c*) composition of a helical or screw-like motion illustrated, giving the basis for the construction of skew-bevel wheels; (*d*) how the most complex motion of a rigid body may be regarded and explained; (*e*) combinations of two motions of translation transverse to each other: 1, giving rise to wave-motion; 2, giving rise to harmonic motion; 3, approximately harmonic motion in ordinary piston and crank motion; (*f*) an example of comparative and relative motions of translation in the motion of a piston of a locomotive; the actual path of a material point in space may be the result of a complicated series of motions; illustrated by a point in a projectile.

COLOR

Light and shade dependent upon the structure of the eye, and its elaborate nervous system; analogy between color distinction and pitch and timbre of notes; range of sensibility of the eye less than that of the ear; one thousand monochromatic tints distinguishable and two million distinct color-impressions (Rood); results of experiments on color-impressions; nature and origin of color-blindness; white light, the resultant of three primary impressions—red, green, and violet; chief sources of color in external objects the selective absorption of the different wave-lengths of light by those objects; origin of a monochromatic tint in color; no simple color from the physiological point of view; color of pigments never even approximately monochromatic; origin and nature of diffraction colors, as the tints of the bubble, mother-of-pearl, insects' wings, plumage of birds, etc.

LIQUID AIR

First liquefaction of air in 1878 and its history; principle of the early processes for the liquefaction of air and other gases; Olszewski's experiments and methods of 1890 illustrated and explained; Professor Dewar's investigations, experiments, methods, and results in this field, 1892; Linde's machine for the liquefaction of air (1895-'98) illustrated and explained; C. E. Tripler's machine (1898) producing six to seven liters (quarts) of liquid air per hour, with an expenditure of thirty to forty horse-power; properties of liquid air; chief commercial value of liquid air; electrical properties of liquid air and their uses; scientific uses of liquid air: (*a*) in physical laboratories; (*b*) in chemical laboratories; (*c*) in technological processes; memoirs and references on the liquefaction of air and other gases.

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						2. Dynamics.
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					3. An elastic body.	
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DIVISION C.—ASTRONOMY

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

Astronomy is the science which treats of the constitution, motion, and appearance of the heavenly bodies, and the art or practice of utilizing their known positions for determining positions on the surface of the earth. It is the oldest of the sciences, and the development of the ideas on which modern astronomy rests is co-extensive with the history of civilization. The field of astronomical science is immensely greater than that of all other sciences combined, since it deals with those masses of matter known as planets, stars, comets, and all other bodies outside the atmosphere of the earth.

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Cassini	Discovered length of Jupiter's day of 9 hours, and 4 of its moons	II-385
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Peters, Christian Henry	Discovered 40 asteroids and several comets	IX-236
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DIVISION D.—CHEMISTRY

What is this? Of what is it composed? Can it change from one form to another? If so, what causes it to do so?

Young children intuitively ask these questions concerning the various objects and forms of matter surrounding them, and he is a wise person who can always give a definite reply to such inquiries.

Later, when the children reach the academic and collegiate period of education, the same questions recur to them in the science of chemistry, in which nature is systematically interrogated. As these questions may be asked of every form of matter in the universe, the field for investigation becomes limitless.

Whether we confine ourselves to the simpler problems of qualitative analysis (what elements are in the body), or the more intricate problems of quantitative analysis (how much of any element is in the body), whether interested in electro-chemical theory and biological chemistry, or in the analysis and subsequent synthesis of organic substances for commercial purposes—whichever way we look and query on these subjects, there is always a great unexplored region.

Fascinating as the theoretical side of chemistry always is to the searcher for material facts, the practical side of this science, doubtless, appeals even more strongly to those interested in the arts and manufactures. Broadly saying, there is scarcely an article manufactured that does not to-day demand, at some stage of its production, the knowledge and services of a chemist. For example, in assaying, in the extraction of metals from their ores, in the manufacture of iron and steel for structures, in textile manufacturing, the production of foods, dyestuffs, inks and pigments, liquors, drugs and chemicals, oils, soaps, paper, in the utilization of waste substances—indeed, the list can be extended indefinitely, and all involve the application of chemical knowledge. To be the consulting chemist for a company or corporation is to occupy a most responsible and highly remunerative position.

The question now occurs, How shall one interested, theoretically or practically, in chemistry ascertain the nature and extent of the science, learn its possibilities as a profession and for direct use in business? We answer most emphatically, by having a set of APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS at hand, and by pursuing a course of reading and study therefrom, covering every department of chemistry. This course, thoroughly read, puts the reader in possession of just what he should know, whether for immediate use, for commercial purposes, or as a solid foundation for becoming a professional chemist. The reader here sees the relative place and importance of every division, subdivision, and topic in the entire field of chemistry. He has the superior advantage of consulting the very highest and most recent authority in the science—not an old discarded treatise, written years ago by explorers in this field. He can pursue the course at any hour he chooses, and as rapidly or slowly as he desires.

A brief outlined course, showing the range and great divisions of the science of chemistry, as treated in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS follows:

Introduction to Chemistry.—Here the history of chemistry and its relation to alchemy are shown. This is followed by exhaustive articles on atom and monad, atomic weights, chemical affinity, early chemical experiments, the field of organic chemistry, the various forms of chemical analysis, stereo- and thermo-chemistry.

Chemical Elements.—This section contains the several groups of elements, as arranged according to the most recent discoveries, also the new chemical elements.

Chemical Compounds.—Here the principal oxides, acids, bases, and salts in chemistry are arranged in lists for study.

Chemistry of Radicals.—A comprehensive grouping of both the alcohols and ethers forms important lists.

Chemical States and Processes.—More than a score of these states and processes are presented, ranging from the nascent state of an element to spontaneous combustion.

Hydrocarbons.—It has been said that modern chemistry has for its two great centers the study of hydrocarbons and carbohydrates.

Beginning with the articles on bitumen, coal, gas, fuel, and heat, the whole field of hydrocarbon chemistry is presented.

Vegetable Oils and Gums.—This list includes the oils and gums, with their history, composition, preparation for market, and use in the arts; also other information of use to the pharmacist and druggist.

Fats.—Such subjects as glycerin, acrolein, butter, oleomargarine, many acids derived from fats, stearin, fats used in soap, are thoroughly treated.

Chemical Principles.—This classified list of topics includes the various animal principles, such as gelatin, kreatin, albumen, protoplasm, and that most complex substance largely found in the brain—protogon. In the list of Vegetable Principles are included the albuminoids, emulsin, gluten, pectose, salicin, starch, and other substances.

Chemical Instruments.—The structure, mode of operating, and use of the various instruments used in chemical research and in the arts are given.

Agricultural Chemistry.—Here is an ever-enlarging field for study and research. The chemistry of soils, that of the ordinary fertilizers, manures, and guano, of fibers and of the chief cereals, constitute a list of subjects both greatly interesting and important.

Sugars.—Their composition, relation between glucose, cane and beet sugar, glucose, diastase, honey, relation of starch to sugar, dextrin, etc., are topics upon which all interested may find full treatment in this Cyclopædia.

Foods.—The list includes such topics as bread, baking-powders, cheese, casein, lard, milk, lactic acid, cooking, preservation of foods, adulteration of foods, pepsin and peptonized foods, flour, salt, and other important topics.

Water and Mineral Waters.—Water, mineral waters, aerated waters, apollinaris water, carbonated waters, chalybeate waters, seltzer and vichy waters are exhaustively treated.

Beverages.—The subjects coffee, tea, beer, and cider form a most interesting group for study; also chemistry of liquors, in which the several intoxicants, from whisky to champagne, are comprehensively treated.

The Chemistry of Medicines and Drugs.—The list of topics under this division is important and exhaustive.

Explosives.—The composition and manufacture of gunpowder, cellulose, nitroglycerin, dynamite, the fulminoids, smokeless powder, fuse, pyroxylin, and other substances are of great importance.

Pigments, Paints, and Varnishes.—Here is a department a knowledge of which is of the utmost value to the artist-artisan.

Bleaching.—The chemistry of the various bleaching agents is exhaustively treated.

Dyeing and Dyestuffs.—Why should we native-born Americans remain ignorant on matters included in the long list of subjects grouped under this division of practical chemistry, and let the European chemists and dyers fill the important positions in this field, when the means for preparing ourselves are so comparatively inexpensive and easy, through the use of APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS?

Nearly sixty important topics, under this division, are exhaustively treated.

Miscellaneous Chemical Industries.—The list includes the chemistry of matches, fireworks, ink manufactures, artificial gems, chemistry of photography, chemistry of leather, of preservatives, of India-rubber, freezing processes, polishes, and all forms of paper.

Biographies of Eminent Chemists.—One of the most interesting and valuable features of this extensive list of topics in chemistry is that concluding the course. Here is arranged, in order, the biographies of those who have made the science of chemistry what it is. A careful reading of these fifty or more biographies will give the reader and student a comprehensive knowledge of the progress made in chemistry through the past decades. But no description of the richness of the entire list of subjects can here be given. The only way to know and appreciate the value of this course in theoretic and practical chemistry is to possess the UNIVERSAL CYCLOPÆDIA AND ATLAS, and thus utilize one's time in reading and studying this great subject.

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By Prof. IRA REMSEN, M. D., LL. D., Johns Hopkins University : Acid, Alcohol, Baking-powders, Carbon, Chemistry, Mineral Waters, Pyrotechny, Phosphoric Acid, Salts.

By Prof. EDWARD RENOUF, Ph. D., Johns Hopkins University : Acetylene.

By Dr. CYRUS EDSON, New York : Adulterations.

By Prof. HARVEY W. WILEY, U. S. Department of Agriculture : Sorghum, Sugar.

By Prof. JOHN W. MALLET, M. D., LL. D., University of Virginia : Water.

By MARCUS BENJAMIN, Ph. D., U. S. National Museum : Etherion, Helium, Krypton, Metargon, Monium, Neon, Polonium, Radium, Xenon.

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Priestley, Joseph	Discovered oxygen; called it dephlogisticated air. Author of 300 publications	IX-463
Dalton, John	Author of the Atomic Theory	III-313
Lavoisier	Discovered composition of water; destroyed the false theory of Stahl and Priestley	VII-95
Hofmann, August	Laid the foundations of "modern chemistry"	V-601
Liebig, Justin von	Founder of organic chemistry—"meat extract"	VII-199
Schönbein, Christian F.	Discovered ozone; invented "gun-cotton"	X-355
Hare, Robert	Invented the oxyhydrogen blowpipe; improved processes in chemistry	V-416
Gore, George	Electro-chemistry; electric separation of metals	V-210
Kirchhoff, G. R.	Inventor of the spectroscopy; made discoveries in spectrum analysis	VI-480
Bunsen	Discovered spectrum analysis; discovered caesium and rubidium	II-232
Mendeleff	Discovered and formulated the periodic law in chemistry, viz., "spec. heat \times atom. weight = constant"	VIII-27
Bergmann	Discovered sulphuretted hydrogen; founded the science of crystallography; blowpipe analysis	I-590
Berthollet	Discovered composition of ammonia; bleaching by chlorine; filtration through charcoal	I-599
Berzelius	Author of systems of chemical symbols. Discovered selenium and thorium	I-599
Davy, Sir Humphry	Showed by galvanism the decomposition of alkalies, and that they are metallic oxides	III-351
Berthelot	Discovered the relation between heat and chemical action. The great synthetical chemist	I-599
Gerhardt, Charles F.	Reformed chemical notation; a treatise on organic chemistry	V-102
Gibbs, Wolcott	Professor of chemistry in Harvard University; platinum elements; vapor density; analytical chemistry, organic and inorganic	V-138
Gilbert, Joseph H.	Great agricultural chemist; founded agricultural experiment station	V-142
Baumé	Invented a hydrometer now in general use; simplified industrial chemistry	I-536
Chaptal, J. A.	Chemistry applied to the arts; published Elements of Chemistry	II-463
Klaproth, M. H.	Discovered zirconium, titanium, uranium, sulphate of strontium; made classification of minerals	VI-584
Barker, George F.	Professor of chemistry in Yale and in Pennsylvania Universities; author of text-books on chemistry	I-500
Bernays	Professor of chemistry, St. Mary's Hospital; author of Household Chemistry	I-596
Chandler, C. F.	Professor of chemistry, analytical and applied, in Columbia University; author	II-459
Clarke, Frank W.	Professor of chemistry in Howard University; author of Constants in Nature; constitution of silicates	II-594
Cooke, Josiah Parsons	Professor of chemistry in Harvard University; author of the New Chemistry; chemical problems and reactions	III-171
Crookes, William	Discoverer of thallium; important discoveries in chemistry; London chemist; Crookes's tubes, etc.	III-255
Doremus, R. Ogden	Professor of chemistry in Bellevue Hospital, New York city; applied chemistry; several patented processes of great use	III-486
Draper, John William	Great researches in spectrum analysis; made first photograph of a living person; professor of chemistry in New York University	III-500
Girardin, Jean	French chemist; author of excellent handbooks on chemistry	V-150
Meyer, Julius	Noted contributor of many chemical papers to periodicals	VIII-89
Meyer, Victor	Exhaustive researches in organic chemistry	VIII-89
Morton, Henry	President of Stevens Institute, Hoboken, N. J.; researches in organic chemistry	VIII-266
Regnault, H. V.	Discovered the action of chlorine on ether; verified the laws of Boyle and Mariotte	X-44
Remsen, Ira	Professor of chemistry in Johns Hopkins University; author of noted text-books on chemistry	X-53
Roscoe, Sir H. R.	Author of Lessons in Elements of Chemistry; chemical action of light	X-182
Rose, Heinrich	Great researches in analytical chemistry; a great chemical contributor	X-183

Sainte-Claire Deville.	Discovered anhydrides, nitric acid; studied six platonic metals; discovered and explained "dissociation".....	X-247
Scheele, Karl William.....	Discovered tartaric acid, manganese, chlorine, baryta, glycerin, Scheele's green, arsenate of copper.....	X-344
Silliman, Benjamin, Sr.....	Professor of chemistry in Yale University; author of text-books on chemistry; fused bodies never before fused.....	X-533
Silliman, Benjamin, Jr.....	Professor of chemistry in Yale University; applied chemistry.....	X-534
Storer, F. H.....	Solubility of chemical substances; agricultural chemistry; text-book, Eliot and Storer's Manual.....	XI-157
Strutt, John Wm. (Lord Raleigh).	Discovered argon, benzin; studies in spectra and researches.....	XI-175
Thomson, Thomas, M. D.....	The first to introduce the use of symbols in chemistry for Encyclopædia Britannica.....	XI-419
Wollaston, William H.....	Discovered palladium and rhodium, and that platinum is malleable.....	XII-498
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MINERALOGY AND GEOLOGY

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

Why should one be interested in these sciences? Because they deal with the materials, forms, and forces with which he is constantly in contact. The mineral constituents of the various soils, the very dust of the highways, the common rocks, the surpassingly beautiful crystalline minerals built on strictly mathematical lines, the interesting chemical groups—all these things the science of Mineralogy makes clear.

Geology, the science of the rocky body, is equally and, perhaps, even more interesting than Mineralogy. The objects of research in Geology are: (1) To ascertain the processes by which textures, structures, and configurations of the crust of the earth are produced and modified; this division constitutes Dynamic Geology; (2) to discover the nature and sequence of changes whereby the present constitution of the earth has been developed, constituting Historic Geology; (3) to determine the localities, extent, and characters of mineral masses useful to man, or Economic Geology.

The earth is the home or dwelling-place of man; and as we are interested in our individual homes planned by human skill and knowledge, so to a degree should we be interested in the history of that larger dwelling-place, the earth, planned, developed, and fitted for man's use by an all-wise Creator.

In APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS the science of Mineralogy is exceedingly rich in treatment, there being more than two hundred and forty separate articles on this science.

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AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The poet Bryant, in his *Thanatopsis*, speaks of "The hills, rock-ribbed and ancient as the sun," and the expression occurs in the Psalms, "And be ye lifted up, ye everlasting hills." These and kindred expressions voice only the common thought that the surface of the earth above sea-level, as to elevation, outline, and general appearance, is the same now as when life first appeared. The mountains, hills, plains, valleys, streams, lakes, and other features of the earth's surface appear stable; but as "Constant dripping wears away the hardest stone," in like manner do the silent forces of denudation—winds, rain, frost, moving water, heat, and cold—cut down and undermine the high places and fill the plains and valleys.

The present aspect of the earth's surface in any locality is the net result of forces acting upon its material for ages past. This particular mountain range or peak, these hills, this plain, valley, river, or stream, did not come into its present condition at a bound; it has a history, and it is the province of the science of Physical Geography to unfold this history and to give us the key by which we may interpret something, at least, of nature's phenomena about us. Granted that a knowledge of the operations of nature in producing the present appearance of the earth would be highly interesting and for our material advantage, where shall we find an interpreter or teacher of this subject?

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Map ;	Means of communication ;
Location and boundaries ;	Industries, occupations, etc. ;
Dimensions and area ;	Commerce ;
Physical features and topography ;	Government ;
Drainage or hydrography ;	Army and navy ;
Geology ;	Finance ;
Climate, temperature, rainfall, etc. ;	Education ;
Flora—plants ;	Religion ;
Fauna—animals ;	History ;
Population and races ;	Bibliography and authorities.

Each State and Territory of the Union is treated in detail in the following order : Map ; origin of name ; boundaries ; dimensions and area ; topography and relief forms ; geology, minerals, and mining ; soil and productions ; plants and animals ; climate ; political divisions (counties) with reference map locating each county ; principal cities and towns ; population ; industries and business interests ; banks ; commerce and navigation ; finance ; means of communication ; churches and schools.

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CHAPTER II

BIOLOGICAL SCIENCES

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

In every land, in sea, in air,
Abundant life is everywhere;
Eons have passed since life began
Its upward march, Monad to Man.

WITH few exceptions, and these existing among abnormal people, most persons are interested in the appearance, habits, movements, tones, and other characteristics of animals. But they may have neither time nor, possibly, inclination to observe and to compare widely differing animals. Their knowledge of this subject is usually limited to the domestic animals about their homes, and perhaps to a meager knowledge of those animals seen at the menagerie or in zoölogical gardens.

It is surprising that many people, supposed to be well-informed and even well-educated, should remain unacquainted with the natures, habits, and characteristics of that grand division of life to which they themselves belong. To go further, to trace the relationships of animals as shown by their anatomical structure, to recognize them in their genera and species as links of one vast chain or fabric of animal life, stretching backward to Paleontologic times—such knowledge, interesting as it is for general information, useful as it often is in the arts, and valuable as it is as a means of mental discipline, has, as a rule, hitherto been limited to the few. But, thanks to the introduction of nature-study in our schools, the study of animal life—zoölogy—is becoming more widespread.

Zoölogy, as a science, begins with Aristotle (B. C. 384–322). No other ancient writer contributed so much to the advancement of this science as he, yet Aristotle mentions only about 500 species of animals.

In modern times zoölogy has undergone three periods of development, and, as a science, it is now in its fourth—the Darwinian or Evolution Period—in which the idea of descent gives a basis for systematic zoölogy.

As existing in their native state—that is, before the invasion of domestication or regulated breeding—all animals are grouped in species, each species being composed of numberless individuals, the latter of which die, but the species endures usually for a long period.

It is difficult to mention the characteristics of any species of animals. According to conservative estimates, the number of species of animals known to science approximates half a million, but good authorities suppose that there are at least a million species of insects alone, including those still undescribed and those known.

Species are grouped for study into genera, genera into sub-families, these into families, as the cat family, the dog family, etc.; families are likewise grouped into sub-orders, these into orders, as the Carnivora, or flesh-eaters; orders are grouped into classes, as birds, fishes, etc.; classes form a larger group known as a branch or grand division, like the backboned branch, the jointed branch, etc.; finally, the several branches grouped into one immense field of life constitute the entire animal kingdom, the study of which is zoölogy.

The modern science of zoölogy requires the facts of the biological relations of animals, their embryology, comparative anatomy, and the facts of systematic zoölogy. These divisions of the science are used for a common end, viz., the search for truth in this department of life.

Interspersed through this Cyclopædia, in its twelve volumes and occurring in alphabetic order, are nearly 3,000 articles pertaining to the study of animal life; and these being taken together present the whole science. Grouping these topics, we find seven grand departments, viz.:

1. Animal Embryology, with subjects; protoplasm, cells, animal histology, comparative anatomy, animal morphology, and human anatomy.

2. Animal Paleontology, with its graphic presentations of life through the several geological ages.

3. Descriptive Zoölogy, with its clear, full, and accurate description of over 2,500 animals, which knowledge constitutes the very best text-book yet produced on this subject.
4. Somatic Anthropology, or, the biology of man.
5. Zoölogical Geography, in which the distribution and habitat of animals in various regions of the earth are accounted for.
6. Advanced topics in biology, among which are biology proper, abiogenesis, evolution pro and con, parthenogenesis, ontogenesis, phylogenesis, heredity, and Weismannism.

In descriptive zoölogy two divisions may be considered: First, that of a detailed study of the seven branches and thirty-six classes of animals; second, the study of the typical animals of each class. The first division presents a clear, complete, and scientific account of the comparative anatomy and histology, the paleontology, the organs and systems, the classification, the nervous, muscular, musco-dermal, digestive, circulatory, respiratory, and reproductive systems of the thirty-six great classes of animals.

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For a reference library on zoölogy, no work extant can possibly rival APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS. This is admitted by every unprejudiced mind. As a complete working library for those who wish to study zoölogy, it is the ideal work for the family, the student, teacher, or the professional zoölogist; to all it is simply indispensable.

BOTANY

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

Whence came the power of Cuvier, the zoölogist, to construct a perfect model of an animal he never had seen, merely from seeing a bone of that animal? Of Agassiz, who could reconstruct a fish from one of its scales? Of Darwin, who showed the inestimable service to man of the humble earthworm? Of Asa Gray, the botanist, who, from a single glance at a tree as he passed it at railroad speed, could determine its exact place in the scale of plant life?

Making due allowance for natural gifts, hereditary tendencies, and the chosen profession of these nature-students, it is not extravagant to say that the early and continuous exercise of their observation gave them the power to see a living being and its place in the chain of life through the bone, the scale, the worm, or the tree.

In the examination and study of the living world, plant life, or botany, is of exceptional value as a means of developing attention, concentration, and observation—the basis of mental power in the individual, whatever be his present or prospective life-work.

Not only does Botany rank, perhaps, first as a means of training the mind to observe and to classify, but some knowledge of plants is serviceable to all. The farmer needs this knowledge to understand intelligently the life and growth of cereals and other plants that he cultivates; the gardener and the florist alike need this knowledge; the lover of flowers—and who does not love them?—finds a higher and more exquisite enjoyment in their arrangement and care if possessed of the knowledge of their lives and relationships; the pharmacist, the physician, and the chemist find a knowledge of plants to be of great practical value. Then, too, on the æsthetic side of life, in art, in literature, in ethical and religious feeling, does not and should not plant life speak to us and teach us lessons?

But how and where shall we find a botanical instructor capable and competent, speaking with authority, adapting his instruction to the capacity and needs of all, from the beginner to the mature

student, and furnishing them material for a lifetime study of plants, if they so desire? With emphasis and without reservation, the reply is: Possess APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS for this botanical knowledge.

In the study of the life and growth of a plant from its seed, such subjects as plant embryology, including cell life, plant histology, anatomy, physiology, morphology, and reproduction are abundantly illustrated and presented in the life of botanical science as it is to-day.

The subject, Botany and Plant Classification, covers a vast field; the former topic treating the subject analytically and historically, while in the latter topic the characteristics of each branch, class, sub-class, order, sub-order, and family, throughout the entire plant kingdom, are given with such precision and accuracy that this feature alone furnishes the most authoritative guide on plant classification.

To the thoughtful person, as he looks upon the plant life of the garden, field, or forest, the question may arise, "From what is this or that flower, grass, or tree a lineal descendant?" In other words, plant ancestry is a subject of great interest.

Under the subject, Vegetable Paleontology, the several floras throughout each geological age are exhaustively treated and illustrated, the dominant types of each age shown, the beginnings, culminations, and decadences of each branch of the plant kingdom are given, and the flora of the present made apparent.

Under the head of Descriptive Botany, the subjects—seeds, growth from seed, root, stem, leaf, flower, and fruit—are exhaustively treated.

The natural divisions of plants are treated with minute descriptions of more than 2,000 plants, a knowledge of which as presented in this Cyclopædia constitutes this work the most practical and valuable botany extant in the English language.

What a botanical library we find as we examine the descriptions of the flowerless plants under the divisions: seaweeds, mosses, ferns, horse-tails and club-mosses!

Then, as we pursue our investigations further under the head of flowering plants, studying the cone-bearing plants, the grasses, sedges, arums, lilies, amaryllis, crocuses, orchids, we find the principal genera and species of plants and their families fully described under their several names.

Of the hundreds of families of plants in the highest sub-class, dicotyledons, mention is here made of only the more prominent ones, such as the willows, crowfoots, mustards, roses, geraniums, spurge, maples, mallows, violets, evening primroses, parsley, milkweeds, borage, mints, nightshades, figworts, honeysuckles, gourds; and last, the family of the composites, with their dandelions, daisies, golden-rods, and multitudes of other members of the flowery kingdom.

The geographical distribution of plants, or geographical botany, is thoroughly presented. The several factors which make the plant flora of any region what it is are given at length.

The subject of plant diseases and pests and their remedies are thoroughly treated in such articles as: Vegetable pathology, phylloxera, rot, smuts, rusts, weevil, gall-insect pests, grasshoppers, the potato-beetle, gipsy-moth, and insecticides.

The bibliography and literature on Plants is full and recent.

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It may be emphatically reiterated that the subject of botany, so authoritatively treated in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS, presents to its readers the very

highest and latest reference-work on this subject and furnishes them with full knowledge of all the material on plant life necessary for mental culture or for professional use.

NOTE.—“All animals and all plants are constantly varying, and these variations may have every conceivable tendency, some being distinctly beneficial, others as distinctly injurious to the forms in which they occur. Every individual, from the moment it begins life, even while an egg, a seed, or a spore, is a partaker in an active struggle for existence; and while accident may occasionally produce a different result, those species and those individuals which are best fitted by variation for their part in the world will survive. Heredity insures the repetition of the favorable variation in the next generation. As a logical result of these factors, a sufficient length of time is alone necessary to people the earth with all its present varied fauna and flora from a single primitive type of life.”

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CHAPTER III

LANGUAGE AND LITERATURE

AS TREATED IN APPLETONS' CYCLOPÆDIA AND ATLAS

MAN is distinguished above all other animals, and is differentiated from them, by his power to articulate sounds, thus forming words, which, arranged according to his mode of thought, constitute spoken language, and, if expressed in visible symbols, written or printed language.

Observation and study show that the order of learning a language is as follows: First we hear, and discriminate spoken words, learn to recognize their associations with objects, acts, and relations; secondly, we attempt to imitate what we have heard, and thus learn to *talk*; thirdly, we learn to read; and, fourthly, to write, or, perhaps, the last two simultaneously.

Prof. William D. Whitney, the linguist, says: "There are, we may say, a thousand different languages in the world, and each of them has a different word for hand, or green, or run; there is no reason why any human being uses one of these thousand words instead of another for a given purpose, except that he hears it used by others, and then himself learns to reproduce it with the same idea which it represents in their use."

Prof. Max Müller, another celebrated linguist, argues that thought without language is impossible. He shows that the development and spread of all languages may be explained by their originating from less than a hundred primitive forms or roots.

The origin, growth, spread, classes, and varieties of languages, and their value in the solution of ethnological and racial problems, constitute most interesting subject-matter.

The subject of Language, Linguistics, and Comparative Philology as presented in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is exceedingly valuable to all persons interested in this branch of knowledge.

Benjamin Ide Wheeler, President of the University of California, a celebrated linguist, was the editor-in-charge of this department of the UNIVERSAL CYCLOPÆDIA. Dr. Wheeler strove to present the phenomena of language in the light of their historical significance, and to treat these in accordance with the methods of the modern science of historical grammar, as distinguished from the merely descriptive methods of earlier linguistic discussion. The plan of his work includes the following divisions of matter:

(a) Articles on the various groups or families of languages, such as the Indo-European, the Semitic, and the Teutonic. These articles undertake to characterize each group, with reference to its geographical location and distribution, its division into separate languages and dialects, with the determining marks or other characteristics of the division, its historical development, and its main characteristics of sound, form, and syntax, considered from a strictly scientific point of view.

(b) Articles on each separate language or dialect that has attained the position of a literary language, with discussion of its main characteristics, geographical extent, division into dialects, and with reference to the most important lexicographical and grammatical treatises, as well as to convenient handbooks for acquiring a practical knowledge of the language.

(c) Articles explanatory of the technical terms of scientific and descriptive grammar, as of prosody or metre.

(d) Articles on various phases of general grammar, the philosophy of language, the history of scientific grammar, and the history of writing.

(e) A brief etymological explanation of all titles in the Cyclopædia whose form or meaning could be made clearer by the addition of such an etymology. In selecting the material to be used in these etymological explanations, the etymology is not viewed as an end unto itself, as may be the case, for example, in an etymological dictionary, but rather as a practical convenience for the purposes mentioned. All these etymologies were supplied by Professor Wheeler himself.

In carrying out this widely comprehensive plan the associate editor called to his aid some of the most eminent specialists to be found in Europe and America.

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LITERATURE

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The written or printed expression of the thought of any people, wherever produced, is its literature. As the oldest manuscripts left us are Egyptian, dating from 2500 B. C., or earlier, literature is of great antiquity.

Since literature is thought in written or printed symbols, its range is co-extensive with man's thoughts and imaginations, his emotions and his deeds.

As an expression of thought, literature may be examined and criticised as to its contents and to its form. The form of expression will depend upon the nationality, the kind and quality of the language used, and the ability of the writer to express thought according to the highest models and ideals of his language and his age; the content of expression (literature) can not always be exactly the equivalent of the thought behind it, since the symbol of thought is interpreted according to the individual comprehension of the reader.

To understand literature in this comprehensive sense, one needs information on two distinct lines—first, the nature, themes, extent, and, to a degree, the content of the literatures of all nations; second, the forms or modes in which literature, as such, is expressed.

For specific information on English and American Literature, the reader possessing APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS has access to one of the highest sources. English literature, as a whole, is treated in fifty-two columns of the Cyclopædia, under Anglo-Saxon, Canadian, and English Literature; in addition, there are special biographies of more than two hundred and twenty-five English and American authors.

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CHAPTER IV

MYTHOLOGY

LITERATURE, on whatever subject, abounds in expressions, literal and figurative, in allusion to myths. The productions of the poet, the scientist, the philosopher, the historian, and the novelist alike are replete with such allusions. So common are they that it seems almost self-evident to authors that their readers possess an adequate knowledge of mythological subjects. That this is not the case a conversation with the majority of such readers would very probably show. It would reveal the fact that only a small per cent. possess more than a vague idea concerning the mythical story or legend in question.

It is evident, therefore, that none who wish to be well-informed can afford to remain long in ignorance upon a matter of such importance, and especially is this true when the means of enlightenment are directly at hand.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is a fountain of knowledge on this subject. After carefully reading the articles on Mythology treated in this Cyclopædia, the reader enjoys literature as never before. The vague, hazy meaning now becomes clear, the allusion to the myth and its pertinency as an illustration become apparent.

There are nearly one hundred and seventy-five separate articles on mythology in the UNIVERSAL CYCLOPÆDIA AND ATLAS, and these are from the highest authorities. When arranged for a course of reading, the topics are included under these divisions: Introductory subjects on Mythology, North American Indian Mythology, Mythologies of the Chinese, of the Egyptians, of the Hindus, Scandinavians and Germans, Roman Mythology, and the rich Greek Mythology.

Outline treatment of the article:

MYTHOLOGY

By Dr. F. B. GUMMERE, Professor of English and German in Haverford College, Pennsylvania.

Introductory Topics.—Derivation etymologically; definition and scope; to be distinguished from the notions of religion, of religious ceremony, of the creed or religion; philosophy of a primitive race; a distinction between creed, religious belief, cult, and myth; of what two factors the myth is an offspring; primary elements of the myth.

History of the Science of Mythology.—Universality of myths; origin of comparative mythology; attempts to explain myths: as allegory, or symbolical of truth; as fact covered with a parasitic growth of supernatural fancies; the methods of Max Müller and Jacob Grimm; theory of the anthropologists.

General Principles.—Limitations of will and passion in producing the myth; theories of Mannhardt, Schwarts, and E. H. Meyer; borrowing myths from race to race; the factors of unbridled fancy and unbridled curiosity; theory of dreams and visions; illustrations from folk-lore.

BASIS FOR CLASSIFYING MYTHS

Savage Myths.—In stories of savages; primitive history—the hero, our native myths; survivals from the days of ancestor worship.

Higher Myths.—Evolution of the myth; poetic myths—personal, romantic, and literary; heroic legends from the great epics; Vedic hymns and Vedic myths compared; criterion for separating myths from legends; connection between myth and religious worship.

THE GREEK MYTH PSYCHE

By Prof. J. R. S. STERRETT, Secretary of the American School of Classical Studies at Athens.

Derivation and literal meaning; a Greek legend; jealousy of Venus and her plot in consequence; the plot foiled by Cupid; Cupid's nightly visit to Psyche—the conditions; curiosity of Psyche and its sad results; subsequent enslavement of Psyche by Venus; invisible assistance of Cupid; Cupid secures Psyche's immortality and marries her; allegorical lesson of this myth, the progress of the soul by the aid of divine love to a happier life; why Psyche is represented in art as a virgin with the wings of a butterfly.

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CHAPTER V

HISTORY, CIVICS, AND POLITICS

DIVISION I.—HISTORY

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

"IN its ordinary sense, history is a narrative of transactions in the order of time, with or without critical and philosophical commentary." "Histories," said Bacon, "make men wise." Certainly, no one can claim to be well-informed who does not possess a definite and accurate knowledge of the great outlines of history. With the most important historical events he should have some acquaintance, and, if possible, much historical knowledge of his own country.

If, as has been said so often, "history repeats itself," how essential a knowledge of history becomes. Patrick Henry, in one of his impassioned speeches (March, 1775), said, "I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging of the future but by the past."

From the humblest citizen to the wisest and most influential statesman, all should have at hand the material from which they may readily obtain clearly expressed, authentic history of those nations that have produced our present civilization.

Without a knowledge of history, how shall one estimate the utterances of this or that public man, whether they be newspaper editorials, public addresses, or legislative speeches—in fact, any theme depending upon historical data? No correct inference can be drawn from misquoted or garbled history; hence, the necessity for accurate and full historical knowledge, from which each may make his own inductions and generalizations, and place his own estimate upon the statements of those who pose as leaders of thought and advice. A knowledge of history, then, is indispensable to those who would be well-informed.

APPLETONS' UNIVERSAL ENCYCLOPÆDIA AND ATLAS contains an ideal presentation of history, both as to authenticity and fullness.

There are more than seventy-five topics treating the Middle Ages, migration and settlement of the Teutons, conversion of the barbarians, union of Latins and Teutons, Mohammed and the Saracens, feudalism and chivalry, the Norman conquest, Crusades, Papal States and the Pope, conquest of the Turanian tribes, and the revival of learning.

Modern history is especially full and rich. There are nearly three hundred separate topics treating the origin, settlement, development, culmination and decline, or continued progress of every European and every Oriental nation.

In American history the treatment is exhaustive and unexcelled. The history of the United States and of each separate State is given so explicitly that no further reference is necessary to obtain a thorough knowledge of this very important subject.

The department of History was under the special supervision of Charles Kendall Adams, LL. D., a historical scholar of the first rank. Dr. Adams himself was the author of many of the historical articles, as the battle of Waterloo, Columbus, and Confederate States. In the last article is given one of the most accurate, thorough, and vivid histories of the great Civil War that have yet been written. The description of the battle of Waterloo by Dr. Adams has been pronounced one of the best, if not the best, accounts of that battle ever written. In addition to the masterly historical articles by Dr. Adams, the following noted scholars contributed articles to this department of the Cyclopædia:

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DIVISION II.—CIVICS AND POLITICS

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The American Government is, in theory, a "government of the people, by the people, and for the people." To render this true in practice requires approximately ideal citizens. The first requisite of good citizenship is character, and the second is a thorough knowledge of the American form of government, and specifically one's relations to that government, his political duties and privileges, and his obligations.

It is probable that most Americans who have the right of suffrage obtain their knowledge of Civics and Politics second-hand, through superficial or narrow discussion with their fellow-voters, and through the editorial columns of the local and metropolitan press, which may or may not always present unprejudiced and truthful political data, reasonings, and conclusions. The public school, the college, and the university are doing their full share in disseminating civic and political knowledge among the young men and women of the nation, but there is still further room and demand for an unprejudiced presentation of such knowledge in every home and in every office.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is the best library obtainable on Civics and Politics, for a resident of the United States. Under the division Civics, or the science and art of government, more than forty articles are presented. These are so exhaustively treated that clear, definite, accurate, full, and authoritative knowledge on the every-day details of our government is given.

Under the division Politics nineteen articles thoroughly treat political science and related subjects.

Another division of the subject treats of representative statesmen and politicians. Under this section the politics and statesmanship of all the noted men of these two classes in the following nations are given: Ancient Greece, ancient Rome, Great Britain, France, Germany, Russia, Italy, Austria, Hungary, Spain, and the United States of America. These biographies form a valuable supplement to the topics on Civics and Politics, since they reveal the actual applications of the principles of civics and politics in different ages and in different nations. One hundred and twenty-five of these politicians and statesmen are thus presented.

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BRANCH A.—CIVICS

NOTE.—"The most important principles upon which all governments should be based are these: Sovereignty is an attribute of the entire organism, and can not be divided; all governments derive their 'just powers from the consent of the governed'; all exercise of governmental power is a trust, and can be justly exercised only for the benefit of the governed; while sovereignty is indivisible, its powers are divisible, as the legislative, the judicial, and the executive."

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CHAPTER VI

ECONOMICS

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

IN modern civilization the term economics has wide application. It may logically include at least four distinct groups of subject-matter, viz.:

Sociology, the fundamental science of society, investigating the principles through which the other divisions of economics are to be understood;

Exchange and Transportation, the act of trading and that of conveying the goods exchanged from one place to another;

Finance, the science of monetary affairs, including that of public revenue and expenditure; and

Political Economy, the science of wealth, and also the science that undertakes to explain prices and price movements.

Thus economics, both as a pure and as an applied science, affects man's material interests and welfare. It would not be incorrect to say that man's material, social, and perhaps moral progress has advanced or retrograded, according as he has gained a clear knowledge of economics and has applied the science individually and nationally.

Since the subject of economics is so intimately associated with individual and public interests, some knowledge of its nature, extent, and applications becomes a necessity to all. APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains such a fund of economic knowledge that its perusal and mastery by any person will equip that person with the essentials of the science.

In one hundred and ninety distinct articles that division of knowledge known as economics receives such thorough treatment that one possessing this Cyclopædia has therein a valuable library on this subject.

Under the division *Sociology*, at least a score of subjects are included, such as the topics sociology, anthropology, socialism, feudal system, serf, pauperism, slavery, nihilism, anarchism, communism, guilds, colony, friendly societies, etc.

The list of topics treating exchange and transportation is extensive. More than fifty important topics are to be found. These are exhaustively treated. The list includes such subjects as fairs, exports and imports, transportation, common carriers, express, interstate commerce, chambers of commerce, exposition, etc.

The subject of finance and exchange is treated authoritatively and exhaustively. The number of topics in this division of *Economics* is at least forty-three; they include such subjects as finance, taxation, public debt, money, coinage, monetary standards, currency, bank, bills of exchange, savings banks, negotiable instruments, securities, trust companies, stock exchange, commercial crises, liquid assets, etc.

Under the division *Political Economy*, the extent of subject-matter and the scope with which each topic is treated constitute this department one of the most exhaustive, comprehensive, yet practical working libraries on this subject to be found. There are sixty-four distinct topics in this branch of economics. They may be grouped under two heads, viz.:

(a) Outlines of the science of political economy.

(b) Correlated subjects.

In this division of political economy, such topics as capital, labor, tariff, free-trade, wages, wealth, tax laws, single tax, rent, coöperation, profits and profit-sharing, corporations, monopolies and trusts, strikes, etc., are fully treated.

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And many other high authorities.

NOTE.—The stages of sequence in social evolution have corresponded roughly to four stages of association. Concourse, fellow-feeling, social instincts, and mutual aid had their origins in animal society, and it was by means of them that animal life was developed into various types. The first stage of association, therefore, was zoögenic. In the second stage the evolution of speech and the genesis of a varied tradition made the social mind self-conscious, and transformed the anthropoid into man. Society was then anthropogenic. The third stage, in which the social mind, acting on spontaneous forms of alliance, created clan, tribe, folk, and nation, was ethnogenic. In the fourth stage a wonderful development of the social constitution, with division of labor, has made possible a high utilization of resources, a rapid multiplication of population, and a democratic evolution of the social mind. Society has become demogenic; the state subordinates and rearranges the social composition, perfects the social constitution, and becomes supreme.

SECTION I.—Sociology

Sociology.

- a. Definition and history of.....
- b. Descriptive sociology...
 - 1. Society.....
 - 2. Population.....
 - 3. The social mind.....
 - 4. The social composition.....
 - 5. The social constitution.....
- c. Historical sociology—associations.....
- d. Explanatory sociology.....

Anthropology.....

Socialism.

- a. Meaning and scope of.....
- b. Early communal system.....
- c. Rise of the modern wage system.....
- d. Characteristics of the modern competitive system.....
- e. Economic antagonisms under the modern industrial system.....
- f. Cause of commercial crises.....
- g. Tendencies toward the socialization of means of production.....

- Feudal system.....
- Serf.....
- Pauperism.....
- Slavery.....
- Civilization.....
- Nihilism.....
- Anarchists.....
- Communism.....
- Guilds.....
- Colony.....
- Friendly societies.....
- Ganancial system, or Spanish community.....
- Fraternal insurance societies.....
- Invention (in sociology).....
- Patriotic societies in the U. S. Clubs for women.....
- Mount Vernon Ladies' Association of the Union.....
- National Congress of Mothers.....

SECTION II.—Traffic, Commerce, and Transportation

- Barter.....
- Market.....
- Overt market.....
- Fairs.....
- Commerce.....
- Exports and imports.....

Transportation :

- a. By caravan.....
- b. By water.....
- c. By roads.....
- d. By canals.....
- e. By railways and steamships.....
- Transportation agencies.....
- Common carriers.....
- Freight.....
- Consignment and consignee.....
- Stoppage *in transitu*.....
- Bill of lading.....
- Sale and delivery.....
- Negligence.....
- Black list.....
- Factor (commission merchant).....
- Express.....
- Postal service as a transporting agency.....
- Law of shipping.....
- Railways.....
- Fast freight line.....
- Interstate commerce.....
- Telephone laws.....
- Railway ownership.....
- Street railways.....
- Canals.....
- Ship canals.....
- Ship railways.....
- Marine insurance.....
- Fire insurance.....
- Bounty (subsidy).....
- Free ports.....
- Warehousing system.....
- Bonded (goods) warehouse.....
- Customs and duties.....
- Balance of trade.....
- Chambers of commerce.....
- Boards of trade.....
- Mercantile agencies.....
- Expositions, international.....
- Expositions, universal.....
- Columbian Exposition.....
- Permanent expositions.....
- Cotton States and International Exposition.....
- Tennessee Centennial and International Exposition.....
- Trans-Mississippi and International Exposition.....

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- Finance.....
- Bibliography on finance.....
- Taxation.....
- Public debt.....
- Money.....
- Gold coin.....
- Silver coin.....
- Copper.....
- Nickel coin.....

- Alloy.....
- Mint.....
- Coinage.....
- Monetary standards.....
 - a. Bimetallism.....
 - b. Monometallism.....
- Bank.....
- Currency.....
- Commercial paper or bills of exchange.....
- Savings banks.....
- The U. S. Bank.....
- Clearing-houses.....
- Stock Exchange.....
- Exchange.....
- Bears and bulls.....
- Check, or cheque, and marked check.....
- Bond.....
- Exchequer bills.....
- Exchequer tallies.....
- Commercial crises.....
- Bankrupt and bankruptcy.....
- Negotiable instruments.....
- Insurance.....
- Building and loan associations.....
- Life insurance.....
- Capital account.....
- Stocks and stock certificates.....
- Silver coinage.....
- Assignat and mandate (France).....
- Consols.....
- Securities.....
- Trust companies.....
- Liquid assets.....
- Scots money.....

SECTION IV.—Political Economy

a. *Outlines of the Science.*

- Nature of and history of political economy.....
- Scope of the science of political economy.....
- Price and value.....
- How value is determined; competition.....
- Function of the speculator and attacks on the present system.....
- Relation of value to utility and cost of production.....
- Distribution of wealth; rent; population; wages.....
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CHAPTER VII

MANUAL, INDUSTRIAL, AND MECHANIC ARTS; ENGINEERING PROFESSIONS AND APPLIED SCIENCE

AGRICULTURE

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

THE primary idea of agriculture is the tillage of land. It is now understood to comprise all those special industries which are connected with the rearing of plants and animals for economic purposes.

The fundamental science and art of agriculture are those connected with maintaining or increasing the fertility of the soil; and it is also an art which rests upon the combined experience of all previous generations.

Some of the more important agricultural questions are the nature and composition of soils and their fertilization, rotation of crops, restoration of worn-out soils, live-stock interests, crops, public lands, roads, agricultural machinery, agricultural education, and literature on agriculture.

Every progressive farmer recognizes the importance of accurate and authoritative knowledge on these subjects, even though he may decry book-farming.

The special articles on agriculture, numbering more than one hundred, that are contained in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS are of such value to the farmer that he can not afford to neglect their perusal and study. In this Cyclopædia will be found every species of subject-matter coming within the needs of the agriculturist. Taken together, the articles form a body of knowledge of unsurpassing richness and usefulness.

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FISHING, LUMBERING, QUARRYING, BUILDING

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

One of the early industries of mankind is that of fishing. As a sport as well as a means of livelihood, it has continued to have its enthusiastic followers.

The occupations and arts of lumbering, quarrying, building of edifices of all kinds, and the arts of carpentry and masonry, related as they are to man's need of shelter, had their rude beginnings in prehistoric times. Their development and progress have kept pace with advancing civilization.

Information on the history and progress made in these arts and occupations is not only highly interesting, but a knowledge of them is frequently of immediate financial value to the contractor and the builder, the architect, and all persons engaged in the building trades, and especially to the owner of buildings to be constructed.

While technical works on these subjects are essential to the professional, a thorough and practical knowledge of them may be obtained from APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS.

On FISHING, the general subjects of fisheries, fish culture, and pisciculture are exhaustively treated; the several kinds of fishing, such as oyster, crab, lobster, prawn and shrimp, pearl, turtle,

sponge, walrus, whale, and seal fisheries are presented in detail; accurate and interesting accounts of the various food and other fisheries, such as the cod, salmon, sardine, trout, shad, pickerel and pike, mackerel, sturgeon, whitefish, herring, are given.

On LUMBERING and relative subjects, the topics forestry, timber and timber trees, and saw-mills are especially extended and valuable. The articles on the principal lumber and timber producing trees, as well as those for all grades of furniture, are of great practical interest.

QUARRYING as a business or occupation is of great importance. This subject is particularly well described in the articles on marble, slate, granite, and building-stone.

HOUSE-BUILDING, CARPENTRY, and MASONRY are fully and interestingly treated by most competent authorities. Twenty-four separate topics on these subjects present a practical and accurate treatise on these industries and arts.

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MANUFACTURING INDUSTRIES

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The most common and at the same time most useful articles to man, whether supplied directly from nature, or produced by discovery and invention, are usually least thought of. We come to think of their presence as a matter of course. Although our actual material wants are limited to comparatively few articles, as warmth, food, clothing, and shelter, yet in thought, as civilization advances, our needs advance in like degree.

The home furnishings, food, and clothing of the humblest peasant or laborer of to-day would have been considered fit for royalty in the early historic age of mankind, to say nothing of his life in the age of the cave-dwellers.

Every intelligent person should possess some knowledge of the history and processes employed in the manufacture of such common articles as salt, sugar, bread, and butter, the ordinary meats and other foods; the dishes and other accompaniments of the table; the adornments of our dwelling-rooms with wall-paper, curtains, carpets, and furniture; modes of lighting and heating; the more common articles of wearing apparel, hats, shoes, and the like; the pin, needle, tack, nail, brush, comb, pencil, pen, ink, paper, soap, matches, and common articles in constant use.

The best, most intelligent, easiest understood authoritative account of every manufacturing industry is found in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS. For instance, the history and manufacture of one hundred and fifty machines, instruments, implements, and mechanical devices is given.

As an illustration of the extent and thoroughness of treatment, there are two hundred and twenty-one articles on Manufacturing Industries in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS.

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MACHINERY AND MECHANICAL ENGINEERING

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

Dr. Robert H. Thurston, of Cornell University, one of the highest authorities on engineering subjects, defines Mechanical Engineering thus: "The designing and construction of all forms of machinery. This is sometimes termed 'dynamic engineering,' as having to do only with moving structures, while civil engineering, concerned mainly with permanent structures, is sometimes called 'static engineering.'"

"Electrical engineering," according to the same authority, "is a modern branch or offshoot of mechanical engineering, dealing with the design, construction, and operation of the mechanism employed in the production, transmission, and utilization of electrical energy, as derived by transformation from some other form of energy, through an appropriate system of 'prime movers.'"

Bearing in mind these definitions of Mechanical and Electrical Engineering and recognizing their great and constantly increasing importance in American life, a trustworthy and practical library on these subjects becomes worthy of notice.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains this library. There are one hundred and fifty-three separate articles on these two divisions of Engineering in this Cyclopædia.

For the student, the amateur, or the professional man in Mechanical and Electrical Science and Engineering, APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS gives, in a most available and practical form, just those principles and features of knowledge required in these fields of Applied Science.

A critical examination of this Cyclopædia on these divisions of engineering will satisfy the inquirer that herein is the library he should at once possess.

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PRINTING AND PUBLISHING

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The effect of the printing-press in scattering broadcast the opportunities for gaining knowledge through books, periodicals, and newspapers is simply stupendous. If, in order to possess books, it were necessary to copy what now appears in print, the particular philanthropy of Mr. Carnegie and men of his type would find no place. From pictorial signs to written alphabetic characters representing sounds, was doubtless a long stride in advance; from simple signet-stamping and tablet impressions to Gutenberg's method of type-making and the printing-press, was an advance whose effects have brought forth fruit in the spread of knowledge everywhere.

The history and details of Printing and Publishing are full of interest. APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains nearly two dozen special and extended articles on Printing and Publishing, and these are written by acknowledged masters of their respective arts. Every phase of these subjects is brought out and treated in an interesting style.

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NAVIGATION AND BOATS

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

As in childhood, so in the early stages of man's history, the fact that wood will float upon water must have early been noticed and experimented with.

From the dug-out of the savage to the magnificent yacht and the palatial steamship of to-day, the advancements made rival those of any other feature of man's progress in civilization. Likewise, the skill and applied science of the modern navigator, who unhesitatingly and fearlessly directs his ship over any maritime portion of the globe, would have been marveled at by the pioneers of this art as practiced by the ancient Sidonian sailors.

Historical accounts of early naval warfare and sea explorations are not uncommon; but detailed descriptions of all classes of water-craft, and the science and art of navigation, are chiefly to be found in special and technical works relating to these matters. Still, one's library is not complete without books upon these subjects, neither need a person remain ignorant of this branch of knowledge when the means are so readily at hand if he possesses APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS.

In the UNIVERSAL CYCLOPÆDIA AND ATLAS will be found everything of interest on NAVIGATION AND BOATS. The evolution of boat-building, from the canoe to the latest developments of ship-building and naval architecture, is thoroughly described; also the science and art of navigation to the present time, including all methods and appliances for rescuing shipwrecked crews and passengers. The CYCLOPÆDIA contains forty-one separate and comprehensively treated topics on Navigation and Boats, covering every phase of the subject.

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 And other competent writers.

ENGINEERING

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

"Engineering, or the art of construction, has for its province the construction of all classes of important works, whether static or dynamic, civil or military, public or private. It has for its basis the constructive arts, and for its code the principles of applied mechanics and the physical sciences." Thus writes Prof. Robert H. Thurston, Doctor of Engineering, Cornell University.

For the present purpose the term will be restricted to three divisions, Mining, Civil, and Military Engineering, leaving Mechanical and Electrical Engineering to be referred to under Machines and Mechanisms.

"Mining Engineering proper deals with mining constructions and operations from the preliminary location to the final operation of the completely organized and working establishment."

"Civil Engineering is now restricted largely by the assignment of other branches to special departments; the construction of 'public works,' as railroads, canals, harbors, and bridges."

"Military Engineering consists in the construction of works for offensive and defensive warfare, including army engineering, the construction of engines, ships, armor, and ordnance."

It is obvious that for an accurate, exhaustive, and technical treatment of all divisions of engineering many volumes must be written, involving large expense to him who seeks information on engineering subjects. The careful attention of those interested in these branches is called to the accurate, full, and recent treatment of *Engineering*, as presented in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS.

Under the titles *Mining* and *Metallurgy*, and the preparation and manufacture of metals from their ores, eighty separate articles are given, including every detail and division of these subjects, as described in the foregoing definitions of Engineering. The subjects of Mines and Mining, ore and ore deposits, economic geology, gold, silver, copper, lead, zinc, iron, and coal mining, as well as the remainder of the eighty topics, are thoroughly treated by the highest authorities and specialists on these industries of mining and the profession of Mining Engineer.

Under the division *Civil Engineering, Surveying, and Geodesy*, the UNIVERSAL CYCLOPÆDIA AND ATLAS is noteworthy in its extent, thoroughness, and authority. Nowhere else can such reliable knowledge for the engineer of the day be found in so practical form for use.

Included in more than one hundred and twelve separate articles, every department of civil engineering is presented, including such subjects as engineering, engineer, civil engineer, experimental engineer, construction, bridges, cantilever, drawbridge, truss, abutment, foundation, arch caisson, factor of safety, strength of materials, stresses, torsion, elastic limit, fatigue of materials, modulus of elasticity, reservoir, reservoir dams, retaining-wall dam, earthwork, embankment, railways, and a hundred more equally important subjects.

In the third division, or *Military Engineering*, including war as a science and an art, and army and navy organization, there are nearly two hundred articles in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS. These articles may be grouped under the following heads:

Military Organization.....	17 topics.
Army Officers.....	13 "
Navy Organization and Naval Officers.....	24 "
Military Education.....	9 "
Military Quarters and Commissariat.....	9 "
Army Discipline and Tactics.....	9 "
Army Equipment—Weapons of War.....	51 "
Attack and Defense in Warfare.....	26 "
Miscellaneous Military Topics.....	15 "
Great Soldiers.....	10 "

These three departments of Engineering as treated in the UNIVERSAL CYCLOPÆDIA AND ATLAS will be found rich and complete in every detail.

AUTHORITIES

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- By Mr. CHARLES KIRCHHOFF, M. E. : Aluminium, Anthracite, Coal, Coke, Copper, Iron, Lead, Mineralogy, Metallurgy, Metals, Nickel, Tin.
- By Mr. GEORGE F. KUNZ, Gem Expert with Tiffany & Co., New York : Chalcedony, Diamond, Emerald, Garnet, Jade, Opal, Pearl, Precious Stones, Quartz.
- By Prof. ROBERT H. THURSTON, LL. D., Dr. Eng., Cornell University : Bronze.
- By the late Prof. THOMAS EGGLESTON, E. M., LL. D., Columbia University : Crystallography, Goniometer.
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- By Rear-Admiral PHILIP HICHBORN, U. S. Navy : Ship-building.
- By Prof. PHILIP R. ALGER, U. S. Navy : Armor, Submarine Navigation.
- By Lieutenant GEORGE F. W. HOLMAN, U. S. Navy : Torpedo-boats.
- By Rear-Admiral FRANCIS T. BOWLES, U. S. Navy : Ships of War.
- By the late Commander CHARLES BELKNAP, U. S. Navy : Nautical Schools.
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- By CHARLES H. DAVIS : Great Circle Sailing.
- By Captain FREDERICK A. MAHAN, U. S. Army, Corps of Engineers : Lighthouses.
- By Rear-Admiral ALEXANDER H. MCCORMICK, U. S. Navy : Navigation.
- By JAMES A. WHITNEY, A. M., LL. D. : Life Boats and Life Rafts.
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Information on all the general subjects is brought up to the present time, with indications, when possible, of the directions in which future developments may be expected. All important matters of

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By Professor MERCUR: Army, Artensals, Cavalry, Discipline, Infantry, Tactics.

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By General HENRY L. ABBOT, U. S. Army: Explosives, Torpedo.

By Captain JAMES M. INGALLS, Artillery School, Fort Monroe: Gunnery, Gunpowder.

By Lieutenant JOHN C. W. BROOKS, Fourth U. S. Artillery: Projectiles.

By Captain LAWRENCE L. BAUFF, Ordnance Department, Washington, D. C.: Machine and Rapid-fire Guns.

By Lieutenant I. N. LEWIS, Ordnance Department, Washington, D. C.: Electro-ballistics, Range-finders and Position finders.

By Captain CORNELIS DE W. WILLCOX, Army Board of Information, Washington, D. C.: Military Insignia.

By Lieut.-Colonel HENRY H. C. DUNWOODY, U. S. Signal Corps: Signal Service.

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CHAPTER VIII

FINE ARTS

MUSIC, ORATORY, AND ACTING

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

THE Fine Arts appealing to the ear are Music, Oratory, and Acting; the last in its elocutionary and oratorical aspects.

Ethnologically considered, music is born of the dance, and the earliest is purely rhythmic, its purpose being to mark the time for terpsichorean performances. The music of the American Indians is largely of this character, although a slight development of melody is discovered. The second stage is the melodic, in which themes are repeated with variations. The third stage is the harmonic, which is a union of co-existent melodies. The fourth stage is the symphonic, when music is a succession of harmonies with varying themes.

The art of address strikes its roots far into the deepest and richest soil of the man himself. Delivery, in oratory, is nothing less than the man, the whole man, speaking—communicating himself. All true orators and great artists in dramatic and musical expression are conscious of a strange and often bewitching power from within. Oratorical or artistic power goes out of them. Magnetism is the life of public speaking and is one great secret of its influence.

On the subject of music, APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS has three hundred and seventeen articles; on oratory and representative orators it has fifty-two; and on acting and actors sixty-eight.

Under the first division of Music, viz., as a science and an art, the one hundred and two separate articles will be found to constitute a most valuable treatise on music written by some of its masters. The articles on musical instruments and the biographies of the great composers, conductors, and instrumental and vocal artists are not less interesting and valuable.

The article "Elocution," properly coming under the head of Oratory, is a masterpiece of writing. It is by John W. Churchill, late Professor of Elocution in Andover Theological Seminary, and it forms a fitting introduction to the study of oratory. The principal Greek, Roman, French, Italian, Irish, English, and American orators are discussed in the several articles bearing their names.

Under the head of "Acting" there are extensive articles on the theater, act, tragedy, comedy, pantomime, harlequin, and the miracle plays, Passion Play, etc.

In the biographies of the most noted Greek, Roman, Italian, French, German, Spanish, English, and American actors, the reader will find authentic information.

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PAINTING, SCULPTURE, DECORATIVE ART, AND ARCHITECTURE

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

The fine art of painting is the most elaborate and complex of all the arts that appeal to the eye. It is therefore the most difficult to understand and appreciate. At the same time, as painting much more than sculpture deals with scenes, incidents, historical events, the illustrations of poems and fiction, landscape and the representation of common objects of all sorts, so it is painting that persons not specially instructed in art are the most apt to care for.

Architecture is the highest of the industrial arts, and the most useful of the fine arts. The architect may impart to his work sublimity, splendor, grace, playfulness, variety, or solemnity, and beautify it by grace of proportion, picturesque outline, play of light and shade, richness of carving and detail, or splendor of color; at the same time he consults and satisfies the demands of durable construction; so that architecture ranks as a fine art with painting and sculpture.

On the subject of painting the UNIVERSAL CYCLOPÆDIA AND ATLAS contains three hundred and twenty articles, and on art and sculpture (in all) nearly six hundred.

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CHAPTER IX

GAMES, AMUSEMENTS, CUSTOMS, FASHIONS, ETC.

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

THERE is a deeply laid basis in our natures for the saying, "All work and no play makes Jack a dull boy." It has been shown that play is instinctive in animals and in man. The function of play is twofold. It is both creative and recreative. In other words, to children and youth, play is anticipative of useful occupation in the future, and in addition it gives recreation. But observation and experience corroborate what Shakespeare wrote :

"If all the year were playing holidays,
To sport would be as tedious as to work."

And Cowper :

"Absence of occupation is not rest,
A mind quite vacant is a mind distressed."

A scientific analysis of play would involve many factors and require great research and study. For practical purposes, play may be considered under the divisions : Games, sports and pastimes, recreations, and exercises.

One of the oldest games, if not the oldest, on record is checkers, or draughts. It originated before 2000 B. C., previous to Abraham's time, and was introduced into Europe from Egypt. Chess, that game which has been called the art of human reason and the touchstone of the human intellect, dates from the time of King Solomon, at least 1430 B. C. Probably the first book printed from metal type in England (1479 A. D.) was *The Game and the Play of Chesse*. Dice is an ancient game, originating with the Greeks and Egyptians, or the Lydians. Football, too, is an ancient game ; and the history of playing-cards shows that the games played with them are several centuries old.

The easiest and most efficient manner of obtaining present-day, reliable information on any game, sport, or recreation, is to consult *APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS*.

Thirty-six games, fifteen sports, and eight classes of recreations are minutely described in the *UNIVERSAL CYCLOPÆDIA AND ATLAS*.

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FASHIONS AND CUSTOMS

"One might as well be out of the world as out of the fashion."
"When you are in Rome, you must do as the Romans do."
"Costly thy habit as thy purse can buy,
For the apparel oft proclaims the man."

These and other epigrammatic sayings express a world-wide characteristic of mankind. In his *Education*, Herbert Spencer says that in education, as in dress and fashion, the ornamental precedes the useful. Be that as it may, as a rule "Fine feathers make fine birds," provided the birds have the discretion to keep silent until the proper occasion arrives.

Frequent changes in fashion and dress, while resulting in increasing expenditures to a large class, are beneficial to the producer and the manufacturer. Most persons probably follow Pope's advice regarding fashions:

"In words, as fashions, the same rule will hold,
Alike fantastic if too new or old:
Be not the first by whom the new are tried,
Nor yet the last to lay the old aside."

The subjects of fashion, costume, dress, and peculiar customs are in nowise unimportant to those who would be well-informed. Whether any particular fashion, however fantastic, is merely a survival of some ancient but, at the time, useful device or pattern, or a revival, or a result of the modiste's invention—these are interesting questions. For example: Why are buttons retained on one's coat sleeve? Why do notches and buttonholes occur in the lapels of one's coat collar? What is the origin of the peculiar cut of the dress coat? etc.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains full recent knowledge on all these subjects.

Under the topics dress, headdress, boots, fans, costume, fashion, motto, coat-of-arms, heraldry, complete information by the highest authorities is given.

Peculiar customs, such as mourning, wake, tournaments, St. Nicholas and Christmas gifts, cremation, dueling, and other topics are comprehensively treated in the UNIVERSAL CYCLOPÆDIA AND ATLAS.

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NOTE.—Without recognition of the philosophy underlying bodily expression, improved dress is impossible. Fashion does not recognize the body; it subjugates it, and becomes itself the central and arbitrary point of attraction. Fashion does not demand the co-operation of the body in expression, but rather seeks in every possible manner to deprive the body of independent expression in order that it may serve as an inconsequential model for the external decoration. Correct dress should not violate either health or the plastic beauty of the figure by cramping any part. The natural points of support, like the shoulders and hips, should be recognized as those from which all drapery should radiate in fine flowing lines free to follow and accentuate the movements of the body until the outward covering expresses the wearer's personality and suggests something special to each individual. The highest type of dress must recognize not only freedom, expression, radiation, and color, but such subdivisions as utility in freedom, grace in expression, harmony in radiation, and subtlety in color—qualities that should remain through all the variations affecting the minor changes in dress.

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CHAPTER X

MEDICINE AND SURGERY

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

MEDICINE is the art and science of curing diseases. Its origin is obscure, but dates back to the early existence of the human race, coincident with the liability to injuries, sickness, and process of decay.

The Chinese have practiced and written of medicine from the remotest ages, but without intelligence or method. The Hindu practice has always been simple. The methodical study of medicine began in the fabulous age of Egypt. The reports concerning the practice of medicine in Greece in early times are legendary. Hippocrates, born in Greece 460 B. C., is known as the "Father of Physic." His remedies were mainly vegetable and dietetic.

Medicine was introduced into Rome from Greece 200 B. C. By his teachings and writings, Galen, a Roman physician, so influenced medicine that he was esteemed infallible authority for fully twelve centuries. He regarded disease as due purely to putridity of the "four humors"—blood, phlegm, bile, and black bile. During the dark ages medicine declined in Europe, but was preserved by the Arabian school, which dominated from the end of the ninth to the end of the fourteenth century. The Italian schools succeeded the Arabian. The great discoveries and researches of the Italians and that of Jenner (vaccination) laid the foundations for the modern practice of medicine and surgery.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS contains more than one thousand articles on medicine and surgery. All the more important articles are signed by and contributed by specialists in their several departments, thus constituting the most valuable library on medicine and surgery ever contained in a cyclopædia, because complete, recent, and by the very highest authorities. The subject-matter in this department consists of special articles on human anatomy and physiology, pathology, therapeutics, surgery, germ theory, and bacteriology, veterinary medicine and surgery, and medical biographies.

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NOTE.—During the nineteenth century devotion to the development of technical and scientific investigation, rather than to speculation, as the true basis of the treatment of disease steadily increased, and warrants the belief that a system of scientific medicine is being erected. This has also been designated an age of "rational empiricism" in medicine, since skill in treatment is largely cumulative from experience, yet rendered intelligible and certain by a clear discernment of the laws of life, of the functional activities which constitute health, and of their perversion in disease. Histology, physiology, microscopy, micro-chemistry, pathology, physiological medicine, pharmacy, and therapeutics are fields of incessant work and progress. Correct and intelligent diagnosis, study of morbid anatomy and etiology, and an accurate knowledge of the physiological effects of remedies are sought as the only substantial basis for the treatment of disease, while its prophylaxis by the use of preventive inoculations was a brilliant anticipation of that which is now realized. In surgery great importance is to be attached to the general diffusion among practitioners of sound physiological, pathological, and therapeutic knowledge, thus enabling the surgeon to operate with facility and judiciously to treat the patient after the operation, thus promoting speedy recovery.

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CHAPTER XI

LAW

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

MODERN law is the system of social order established and enforced by the state and its governmental organs.

In early times and in semi-civilized communities the *domain* of law is regularly determined by race or by religion; so that the law of a certain tribe or that of a certain confession or sect follows the members of the tribe or sect everywhere, and governs them only. Until a very recent period most European countries recognized that the peculiar laws of the Jews governed their marriages and family relations; and in British India the courts still recognize and enforce the laws and customs of the different confessions. In the U. S., Indians living under tribal government are largely ruled by their own national laws. In most non-Christian countries, Europeans and Americans are regularly exempted from the local law, and are governed by their own national laws; but these survivals of an older practice are tending to disappear. The modern principle is that all laws are *territorial* in their operation, governing all persons within the territory except foreign sovereigns and diplomatic representatives of foreign countries.

The common law of England and the United States, which rests upon the basis of judicial decisions, is the persistent custom of the judicial department of government. A rule of law is regularly a declaration by some authorized organ of government that certain acts or a certain state of facts shall have certain legal results. The subject-matter of jurisprudence includes that of law, rights, duties, legal relations, and sanctions.

The entire field of law is substantially treated in seven hundred and twenty-five separate articles contained in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS.

For example, under the several divisions of Substantive Law—public and private—there are two hundred and eighty-four exhaustively treated articles; eight topics on persons (in law); twelve on the family; one hundred and sixty-six on property, including one hundred and twenty-two on contracts.

Under the division of Remedial Law there are one hundred and thirty-two topics on criminal law, and one hundred and thirty-two topics on civil cases and procedure. International, historic, and foreign law are treated in one hundred and six topics; twenty-one topics are on miscellaneous legal subjects; twenty-one topics on Admiralty and Maritime Law; and twenty-four on the biographies of eminent jurists.

A critical examination of any or all of these seven hundred and twenty-five law subjects will convince the reader that APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is a law library of unsurpassing excellence.

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NOTE.—While the laws of all ages and of all peoples are theoretically and practically made in order to enable every man to demand and receive his due from his fellow-men—in short, to enable him to live in the full enjoyment of all those rights which are his according to the degree of enlightenment of those by whom the laws are made—they do not always attain this object. The imperfections of human language, the mistaken notions of those who make the laws, the necessity of expressing the laws in general terms, all conspire to bring about those cases in which the law, as it must be administered by the judge, works incidental injustice. The only remedy for this injustice is to change the law. In many cases equity may step in to modify the decision where a strict adherence to the rules and forms of the common law would do injustice; but equity itself is governed by certain rules, and can act only according to established rules and principles, and can not relieve against the express provisions of statute law.

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CHAPTER XII

EDUCATION

AS TREATED IN APPLETONS' CYCLOPÆDIA AND ATLAS

IN general, education consists in the development and cultivation of all the powers of man. As an art, it attempts this development and cultivation by so adapting the means or material—the subject-matter—to the individual to be educated that he may become the ideal individual. As a body of doctrine pertaining to the training of children and youth, the science of education is pedagogics.

To all persons the means, the process, and the result of this development and training summed up in the word *education*, should be of great interest, as, indeed, it is of vital importance. To the constantly increasing body of men and women engaged in teaching, the study of education as a science, or pedagogics, becomes a necessity, since teaching is now to be ranked as a profession.

The threefold nature of pedagogics, the three M's of the science, a knowledge of which is in constant demand by the teacher may be classified thus: Matter, Mind, Method. In other words, teachers must possess: Knowledge of subject-matter, or knowledge of subjects; knowledge of mind, or psychology and mind-growth; knowledge of method, or educational history, schools, systems and method of education.

For teachers, professors, and superintendents of schools, the best home, class-room, and school working library is APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS, because it is accurate and complete in its presentation of knowledge; accurate and complete in its exposition of every phase and division of the new psychology, and because its treatment of schools, educational systems and methods, from the Kindergarten to the University, in our own and other countries, is complete and authoritative—a library on educational science as it exists to-day.

In its subject-matter, APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS speaks for itself in every department of knowledge.

In *Physiological psychology*, the educational psychology for teachers, the UNIVERSAL CYCLOPÆDIA AND ATLAS is immensely rich. There are ninety-five special articles on this subject, the whole constituting the most valuable and usable knowledge for teachers ever written in English.

In its treatment of Educational history and methods, the UNIVERSAL CYCLOPÆDIA AND ATLAS is unsurpassed. The list of subjects on educational history and biography includes all the noted educational reformers and their work. Under the division Educational Systems and methods, schools and institutions, the list of topics is extensive and the treatment of every topic most satisfactory even to the severest educational critic. There are twenty-five articles on systems and methods; seventeen on schools; seventeen on Miscellaneous Educational Matter, such as public education in England, France, and Germany, school laws, illiteracy, school statistics, etc., and forty-one special articles on universities and university education.

To teachers, APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is truly the best means for studying pedagogics at their own homes, at their own leisure, and with least expense, as it contains more knowledge than the best university can offer. Including the strictly pedagogical subjects and the closely related department of philosophy and ethics, there are four hundred topics treating education, one hundred and forty of which deal with educational psychology.

The authorities on education and schools as treated in the UNIVERSAL CYCLOPÆDIA AND ATLAS are:

Dr. CHARLES K. ADAMS, Editor-in-chief of the Cyclopædia.

Dr. WILLIAM H. PAYNE, Chancellor State Normal University, Nashville, Tenn.

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 Dr. DANIEL C. GILMAN, ex-President Johns Hopkins University.
 Dr. WILLIAM T. HARRIS, U. S. Commissioner of Education.
 Prof. J. MARK BALDWIN, Ph. D., of Princeton University.

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CHAPTER XIII

PHILOSOPHY AND ETHICS

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

EVERY person who thinks, who reflects concerning the relations of cause and effect, who endeavors to find some ultimate cause or principle upon which all systematized knowledge is founded, is a philosopher. Philosophy, then, is the science of sciences. Whenever man attempts to refer all his thoughts to one thought, he begins to philosophize. Each nation's philosophy is an endeavor to solve, by some one principle, the problems of the world as they appear to it from the standpoint of its national life.

Since the philosophic solution of a problem consists in the reduction of the immediate and contradictory elements, as they are given in life, to the ultimate terms or expressions that indicate the universal and necessary conditions out of which those elements have arisen, therefore every philosophy has two factors, (1) the temporal and finite one—that is, the then present world of man and nature which involves problems to be solved; (2) an eternal and an infinite element, or the permanent and unchangeable ultimate idea, through which the solution is wrought out and by which the temporal and finite is explained.

Psychology, or the science of the mind, investigates and seeks a rational solution of the problems furnished by mental phenomena in animals and in the individual, the nation, and the race.

Logic is the science that deals with the forms of thought determining their validity or otherwise from the basis of primary judgments.

Ethics, or moral philosophy, is the theory of the value of human conduct. It is a branch of philosophy as distinct from the curriculum of the sciences.

Thus philosophy seeks to explain or interpret all phenomena from one principle; psychology to explain how mental phenomena are produced; logic seeks to ascertain whether our conclusions are true or otherwise; and ethics seeks to determine the value of our conduct.

It is well-nigh unthinkable that any normal mind should find no interest whatever in some one or all of these four departments of knowledge, since, wittingly or not, every person's character and acts are based upon these four factors involved in human existence.

In seeking a knowledge of philosophy, psychology, logic, and ethics, it is of the utmost importance that the reader, student, or investigator should have access to clear, accurately expressed, definite, full, authoritative, and recent knowledge on these branches; otherwise a chaotic, confused mass of notions on these subjects will result, and the reader would better have employed his time in investigating other fields of learning.

APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS is without question the best source of knowledge extant on these subjects.

A careful and candid reading of the two hundred and sixty six articles on these subjects will result in a clear, definitely arranged, comprehensive knowledge of these great departments. Under the division "Subject-matter of Philosophy" there are forty-six articles. These embrace some of the most fundamental themes and problems in the province of philosophy.

Another division of this subject consists of eighty articles on the several systems and schools of philosophy and ethics. Here the reader or student will find a complete history and discussion of philosophical and ethical theory from the earliest Chinese, Hindu, and Greek systems down to the present.

The subject of Psychology, as treated in the UNIVERSAL CYCLOPÆDIA, is extraordinarily rich in extent and completeness. Under the division Physiological and Empirical Psychology, there are ninety-five separate articles defining, describing, and discussing the very latest researches, methods, and results in this field of inquiry; while under another division, that of Philosophical or Rational Psychology, there are thirty-two principal articles besides the minor ones,

the entire list of topics in both divisions forming the most valuable library on Psychology in the English language.

The subject of Logic is treated in fifteen articles, and is presented in a manner at once clear, intelligible, and thorough.

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CHAPTER XIV

THEOLOGY, RELIGIONS, CHURCH HISTORY, CHURCH SECTS, ETC.

AS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

RELIGION exists as an inward state of feeling—a sense of duty toward a Being or Beings regarded as divine and supreme—and also as an outward expression of that feeling in acts of worship and service. The science of religion, therefore, should analyze and classify the religions of the world—both the religious feelings and convictions of men, and the forms of worship and service in which these convictions and feelings find their natural expression.

Theology, on the other hand, deals exclusively of the facts, whether of consciousness or of revelation, from which religion, both subjective and objective, proceeds, and, educing the truths and principles which the facts embody, it formulates and groups them into the doctrines which constitute theology.

The Bible, popularly known also as the HOLY BIBLE and Holy Scriptures, is a collection of ancient writings, from the age of Moses down to the death of the Apostle John at the close of the first century, thus embracing fourteen centuries. It is divided into two parts, the Old and the New Testaments—the first is regarded by the Jewish Church, and both are regarded by the Christian Church as the inspired record of divine revelation.

The subject-matter of the Bible, the history of its books, great personages, and noted events, are matters of importance, especially in relation to religions and theologies. The entire field of the Bible and of religion, theology, church history and doctrines constitutes an essential department of a liberal education.

The best and most authoritative library on the subject for practical use by the layman or the professional is contained in APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS. Herein will be found nearly one thousand separately treated articles on the Bible, on religions, monotheistic and polytheistic, and the biographies of famous theologians. The Christian religion with its theology and church history, sects, and organizations, is treated in five hundred and fifty articles by the most learned and famous representatives of each religious denomination.

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APPLETONS'
UNIVERSAL CYCLOPAEDIA
AND ATLAS

ONE THOUSAND QUESTIONS

ON SUBJECTS TREATED IN APPLETONS' UNIVERSAL CYCLOPÆDIA AND ATLAS

NOTE.—In the column headed "location on page," 1 and 2 signify the first and second columns on the page; "u," "m," and "b" signify respectively the upper, middle, and bottom part of the page.

Thus, "1 u" means upper part of first column;
 "1 m" " middle " " " "
 "1 b" " bottom " " " "
 "2 u" " upper " " second "
 "2 m" " middle " " " "
 "2 b" " bottom " " " "

QUESTIONS.	Vol.	Page.	Location on page.
1. Who is known as "the father of the faithful" and "the friend of God"?	I	15	1 b
2. According to English law, may a king abdicate his crown?	I	9	2 u
3. Who discovered the aberration of light? Why was this discovery an important one?	I	12	2 u
4. What are the earliest inhabitants of a country called?	I	14	2 b
5. What is the earliest known organization of a total abstinence society in the U. S.?	I	16	2 m
6. Who founded the first academy?	I	19	1 u
7. How does the jelly-fish capture its prey alive?	I	20	1 b
8. When and where was the first accident-insurance company formed?	I	23	2 u
9. What was one of the earliest uses of the storage battery or accumulator?	I	26	1 b
10. Who was Achilles? How did he meet his death?	I	28	1 u
11. What is the simple test for an acid?	I	28	2 m
12. How does the intensity of sound vary?	I	31	2 m
13. The inner ear has how many microscopic cords stretched within it to receive vibrations resulting in the sensation of sound?	I	36	2 u
14. What celebrated temple was situated on the Acropolis of Athens?	I	37	2 m
15. What three important effects do the rays of the sun produce?	I	38	2 u
16. Criminal actions are always prosecuted in what name?	I	39	1 b
17. Where is the Adirondack Park? For what resort is it of priceless value?	I	46	1 u
18. Why are admirals frequently called flag-officers?	I	47	2 m
19. What are the principal adulterants of bread? Of butter?	I	50	2 b
20. When, where, and by whom did ballooning originate?	I	54	2 m
21. To whose theory of knowledge is agnosticism traceable? Who first suggested the term "agnostic"?	I	75	1 b
22. What were the provisions of the "agrarian" law?	I	76	1 m
23. For what purpose are "agricultural experiment stations" carried on?	I	79	2 u
24. Should the so-called abandonment of Eastern farms cause apprehension? Why not?	I	81	2 b
25. To what government does Dawson City (Klondike) belong? (See map).	I	96	Map
26. What is an albino?	I	101	2 u
27. What most celebrated contralto singer of the nineteenth century sang at Rossini's centenary and then declared she would never sing again, not even in her own home?	I	102	1 u
28. Of what is acetylene composed? How is it made?	I	605	2 b
29. What three elements compose alcohol? From what is rum made?	I	105	2 m
30. Who valued the Iliad so highly that every night a copy of that poem was placed along with his sword under his pillow?	I	109	1 m
31. What was the first known treatise on algebra?	I	115	2 b
32. By what two means, or methods, have astronomers acquired a knowledge of two immense dark bodies, forever invisible to human eyes, and incapable of producing any motion that can yet be detected by the ordinary telescopic measurement?	I	117	2 b
33. From whom did we (Americans) learn to make hominy, johnny-cake, and maple-sugar?	I	119	2 m
34. "By raising the potential to 20,000 volts, or even to 30,000 volts, it becomes possible to transfer hundreds of horse-power over conductors no larger than an ordinary telegraph wire." This is due to the remarkable property of what kind of electric currents?	I	137	1 m
35. What mighty river has a descent of only an inch to the mile for 2,500 miles?	I	144	2 u
36. What country of South America has given to the world more gold than California?	I	153	1 m
37. What is meant by "weighing the anchor"?	I	204	2 m
38. Who is known as the "Children's Friend" on account of his most interesting tales, which have given him a world-wide reputation?	I	206	1 m
39. What locality, according to Humboldt, "affords in the smallest space the greatest possible variety of impressions from the contemplation of nature? Here man is enabled to view alike all the families of plants and all the stars of the firmament?"	I	208	2 u

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40. What noted spy drew with a pen and ink a portrait of himself the day before his execution? This portrait is now in Yale University.	I	209	2 b
41. What is the famous story of Androcles and the Lion?	I	211	2 m
42. Why is the angel-fish so called?	I	213	1 m
43. What is the most sportsmanlike way of catching bluefish?	I	215	2 m
44. In view of what fact does it become evident that our own civilized human nature does not altogether differ from that of the savage?	I	221	2 u
45. What remarkable animals are slave-makers, being carried and fed by their slaves?	I	227	2 b
46. What quite large animal of very swift movement is entirely free from fat?	I	229	2 b
47. Jurists say that without a crime there is no criminal; anthropologists say that the criminal is here with the intent to commit crime. Which is right?	I	237	1 u
48. What is the "Bertillon method" of identifying criminals, the chances of error being only one in 13,000,000?	I	599	1 b
49. What noted wall in Scotland was 36 miles long and 20 feet high? By whom and when was it built?	I	247	2 b
50. What animals have been termed the "milch cows" of the ants?	I	252	1 m
51. In what Protestant church are lessons from the Apocrypha included in the latest revision of the lectionary?	I	253	2 b
52. What is meant by "a posteriori" and "a priori" reasoning and knowledge?	I	257	1 u
53. What is the most famous highway in the world?	I	260	1 u
54. What is the most important fruit of temperate climates? There are four or five thousand varieties. How are new varieties produced?	I	260	2 u
55. What nation has made the least progress in the industrial arts?	I	269	1 m
56. What was "Brehon law"? Why is this body of law valuable?	II	153	2 u
57. What is the difference between "mediation" and "arbitration" in settling disputes?	I	278	2 m
58. Where did the arch probably originate?	I	281	1 m
59. What and where is the most magnificent modern triumphal arch?	I	283	1 m
60. Who was the author of the historic expression "Eureka" (I have found it)? also, "Give me where I may stand, and I will move the world"?	I	287	2 b
61. What country is the birthplace of historic architecture?	I	289	2 u
62. What two causes led to the decay of Gothic architecture?	I	301	1 u
63. What is the origin and meaning of the so-called "knock down" argument?	I	309	2 b
64. What is the most ancient voyage of discovery mentioned by poet or historian? What was its object?	I	309	1 m
65. Whom did the ancients call the father of those who know?	I	315	2 u
66. What is the river of the U. S. whose banks expose to view geological strata of all the formations in their regular places to the thickness of 25,000 feet?	I	316	2 m
67. What is the precise difference between Calvinism and Arminianism?	I	323	1 b
68. To whom belongs the credit of originating the idea of applying armor to the sides of warships?	I	327	2 b
69. Who wrote the poem "The Light of Asia"? What is its subject?	I	339	2 b
70. What recent English poet and critic is called "the apostle of culture"?	I	340	2 u
71. Under what circumstances is a private person bound to make an arrest?	I	343	1 m
72. What is an effective antidote for arsenic poisoning?	I	345	2 b
73. How can one tell whether an artery or a vein is wounded?	I	347	2 u
74. What is the deepest artesian bore-hole ever drilled?	I	348	2 u
75. In what battle and when were cannon first used?	I	351	1 m
76. What are the asteroids? What is their probable origin?	I	380	1 b
77. With what nation did astrology (predicting human events by the stars) originate?	I	382	2 b
78. Which is the oldest of the sciences?	I	383	1 b
79. What recent theory would seem to account for the sun's heat and light?	I	385	1 m
80. What discovery probably marks the highest achievement of the human intellect?	I	386	1 u
81. What is the explanation of the reappearance in animals and plants of traits belonging to their remote progenitors, which their immediate parents did not present?	I	387	2 m
82. In mythology, who was the goddess of wisdom?	I	391	1 b
83. Why is an atlas (in geography) so called?	I	398	1 m
84. Of what great English philosopher and statesman is it said, "It seemed as if Fate had raised him to the highest pinnacle that his fall might be the more tragic and conspicuous"?	I	439	2 b
85. What are bacteria?	I	442	1 b
86. What is meant by the "balance of trade" of a country?	I	459	1 m
87. Who is the most famous French novelist of the nineteenth century? Dante wrote the Divine Comedy, but this novelist wrote the Human Comedy.	I	476	2 m
88. What was the earliest banking institution in Europe?	I	482	1 m
89. When was the name "Baptist" first applied to this body of Christian people?	I	489	1 u
90. One of the greatest of Greek philosophers divided the human family into two classes, Greeks and barbarians. Who was he?	I	494	2 u
91. What is the origin and significance of the red stripes on a barber's pole?	I	495	2 u
92. What cereal is said to be more widely distributed than any other grain?	I	501	2 m
93. Why is mercury used in the barometer?	I	506	2 m
94. Why does a slowly rising barometer usually give assurance of fair weather?	I	509	1 b
95. What was the cause of the Massacre of St. Bartholomew?	I	516	2 m
96. What was the first real step toward progress in the development of baseball?	I	520	2 u
97. In baseball, what is meant by a "foul"? How is a "curved" ball pitched?	I	521	1 m
98. What was the famous Bastille? When and by whom was it destroyed?	I	529	2 m
99. What is the medicinal value of hot, cold, Turkish, and Russian baths?	I	531	2 b
100. Why are beads so called?	I	543	1 u
101. Who was the greatest ancient writer of fables, and who their greatest modern writer?	I	547	1 m; 2 m
102. How do beavers construct their dams?	I	551	1 u
103. Whose name is regarded as the greatest in the ancient literature of Britain?	I	553	2 b
104. "Nature never makes new organs for new functions she wishes performed." By what means, then, is the new function performed?	I	557	1 m

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106. What is the most densely populated country of Europe?.....	I	567	1 m
107. On what street of what German city is one of the most imposing statues ever erected?.....	I	592	2 m
108. What European city has the most perfect and inexpensive system of sewerage existing?.....	I	593	2 m
109. What treaty, formulated in one month, is the longest ever written?.....	I	594	2 m
110. Why is the Doctor's degree granted by the University of Berlin so highly valued?.....	I	595	1 m
111. When and by whom was the greatest modern revision of the English Bible made?.....	II	8	2 m
112. When and where was the present form of the bicycle first introduced?.....	II	11	2 u
113. What was the earliest form of the game of billiards? When and by whom was the game introduced into America?.....	II	16	2 m
114. In bills of exchange, what is the important difference between business paper and accommodation paper?.....	II	19	2 b
115. What is considered to be one of the greatest of Sir Isaac Newton's mathematical discoveries the formula of which was placed on his tomb?.....	II	24	2 u
116. In what five important respects do animals and plants differ from the mineral kingdom?.....	II	26	1 u
117. What is the origin of the story of Bluebeard?.....	II	66	2 u
118. By what comparatively simple process is cast or pig iron produced from iron ore?.....	II	63	1 u
119. Why are "blue laws" so called? What is the origin of the expression "true blue"?.....	II	67	2 m
120. How may water be heated to any degree of temperature without boiling?.....	II	79	1 u
121. In the higher class of people of what great nation did the color of the shoes worn indicate their rank?.....	II	99	2 u
122. What is the origin of the term "boycotting"?.....	II	125	1 m
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124. What metal made from copper and tin stands next to iron in importance in the arts?.....	II	189	1 u
125. What is the oldest wooden bridge on record, and for what is it celebrated in history?.....	II	162	1 m
126. How are the various patterns and colors of calicoes produced?.....	II	282	2 b
127. Who is the father of Presbyterianism, and what is the only blot on his name?.....	II	293	1 m
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129. Who are "senior wranglers"?.....	II	305	2 u
130. Where, when, and by whom was the first camp-meeting held?.....	II	313	2 b
131. Who are the great Canadian poets?.....	II	317	2 m
132. Where, when, and by whom, and for what purpose were the first canals built?.....	II	320	2 u
133. Who was the first circumnavigator of the globe?.....	II	329	1 b
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137. What noted philosopher proposed thought as a basis of existence?—i. e., "I think, therefore I exist"?.....	II	377	1 m
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141. From what mountain-top does tradition say Buddha ascended to heaven?.....	II	445	1 b
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144. What animal can to some extent change its color through its own will? How?.....	II	451	1 u
145. What are "chambers of commerce"? When and where first established in Great Britain and in the U. S.?.....	II	453	1 u
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147. Through whose efforts and discoveries are we enabled to interpret hieroglyphic inscriptions on Egyptian monuments?.....	II	456	2 u
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154. What element forms a large proportion of the earth's crust?.....	II	500	2 b
155. What is the atomic theory? Who first proposed it?.....	II	502	2 m
156. What is the composition of air? Of water? Of common salt?.....	II	505	1 m; 2 m
157. What game has been called the art of human reason and the touchstone of the human brain?.....	II	509	2 m
158. What place was a small village in 1830, and is now a city of over 1,500,000 in population?.....	II	519	1 b
159. What animal most resembles man in general appearance? Which is most nearly related to man, anatomically?.....	II	528	1 u
160. How many syllables constitute a Chinese word? Does this fact show a decay in the language, or a primitive condition?.....	II	533	1 u
161. What is the weakest side or phase of the Chinese literature?.....	II	536	2 b
162. What substance forms the outer covering, or skin, of insects, crabs, lobsters, etc.?.....	II	539	2 m
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164. Of what does chloroform consist? When, where, and by whom was it discovered?.....	II	542	2 u
165. From what is chocolate produced? Why is it so nutritious?.....	II	543	2 u
166. What germ causes cholera? Who discovered this and when?.....	II	544	1 m
167. When and where did the "Young People's Society of Christian Endeavor" originate?.....	II	549	1 b
168. What is the chromosphere of the sun, and when only is it visible to the naked eye?.....	II	555	2 b
169. What instrument is used to measure the velocity of light? also to measure the speed of projectiles?.....	II	556	2 b
170. What memorable Roman conspiracy did Cicero by his eloquence crush?.....	II	567	2 m
171. What is the famous problem of "squaring the circle"?.....	II	575	2 m

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173. What are the provisions of the "Civil Damage act" in law ?	II	584	2 m
174. In sociology, where does the "clan" have its place ?	II	590	2 u
175. In literature, what is a "classic" ?	II	596	1 m
176. How do fire-clays differ from pottery-glazing clays ?	II	598	1 u
177. In ascertaining bank balances, how does the New York Clearing-house accomplish in ten minutes what could not be otherwise done in less than six or eight hours ?	II	601	1 m
178. When and where, and for what purpose was the obelisk, now standing in Central Park, New York city, first erected ?	II	604	1 b
179. Who was the first to institute ostracism, and was himself the first to suffer from it ?	III	14	1 u
180. What English king devised a clock composed of twelve candles graduated to burn two hours each ?	III	15	1 u
181. In legislative bodies, what is meant by "cloture" ?	III	17	2 b
182. What king, hard pressed by his foes, appealed to the God of his wife, promising that, if victorious, both he and his army would worship the Christian God ?	III	19	2 m
183. How many pounds of coal will, when properly utilized, represent the labor of a man for one year ?	III	25	1 m
184. From what is carboic acid made ?	III	29	1 b
185. What is absolute cold, or the absolute zero of the physicist ? What is the greatest degree of cold yet produced artificially ?	III	55	2 u
186. What college was the first to open its doors to women ? When ?	III	65	1 b
187. What is meant by color-blindness ? What is its cause, and how is it detected ?	III	76	1 u
188. What is the probable origin of comets ?	III	90	2 b
189. What is undoubtedly the true cause of commercial crises ?	III	97	2 b
190. How are soups and broths prepared ?	III	173	2 b
191. Who built after his own designs the first locomotive engine ever constructed on the American continent ? When ?	III	176	1 b
192. What were the corn laws of England ? When repealed ?	III	198	1 u
193. Nine-tenths of all the "salad-oil" consumed in the U. S. consists of cotton-seed oil. How is cotton-seed oil manufactured ?	III	216	2 b
194. Over 1,000 kinds of true crabs are known. What are the peculiarities of the hermit-crab ?	III	233	2 b
195. What is a creole ?	III	243	2 b
196. When and for what purpose did the children's crusade occur ?	III	263	1 u
197. What naturalist had such an intimate knowledge of the structure of animals that he could, from a single bone or small fragment of a fossil animal, determine the order and even the genus to which it belonged ?	III	294	1 b
198. How is the relative blueness of the sky ascertained ?	III	295	2 b
199. What is a cyclopedia ?	III	298	2 m
200. What historic incident illustrates true friendship ? (See the article "Damon and Pythias.")	III	318	2 b
201. What people or nation required its children to be trained in the art of dancing from the age of five years ?	III	321	2 b
202. Who was the poet Dante's inspiration, and is intimately connected with his production of the Divine Comedy ?	III	331	2 m
203. What is Darwinism ?	III	342	1 u
204. At the time of our Lord, what was the only day of the week that had a specific name ?	III	352	2 b
205. What is the most recent and most successful method of teaching the dumb to speak ?	III	356	2 u
206. What animals cast out and renew their teeth continually ?	III	363	2 m
207. What is meant by the declination of the magnetic needle ?	III	369	1 b
208. Why was Decoration Day fixed on May 30th ?	III	369	2 b
209. How are "deep sea" soundings now successfully made ?	III	374	1 u
210. What class of animals begin their lives as backboned animals but in the adult stage become mollusks ?	III	376	1 b
211. Why is longitude reckoned east and west and latitude north and south ?	III	377	2 u
212. What two French artists of the nineteenth century began a transformation in painting that has affected every school of art in the world ?	III	378	2 b
213. By whom is it supposed the oracles at Delphi were uttered ?	III	384	2 u
214. Who was Delsarte and what is the basis of his system ?	III	385	1 b
215. What are the essential principles of democracy ?	III	388	1 m
216. How does a Jeffersonian Democrat differ from a present-day Democrat ?	III	392	2 u
217. What is meant by demoniacal possession ?	III	397	2 m
218. What were the most famous speeches of Demosthenes ?	III	398	2 m
219. What is meant by the "dental formula" ?	III	402	1 b
220. In dentistry, how are artificial crowns (teeth) supplied without the use of a plate ?	III	405	2 m
221. By what agency were most of the valleys of the world formed ?	III	406	1 m
222. What is the "queen city" of the plains ?	III	406	1 b
223. Who are dervishes ?	III	411	1 u
224. What city of the U. S. has been claimed by three different sovereigns, and since this country has held it had its government thrice transferred, twice besieged by the Indians, and once totally destroyed by fire ?	III	417	2 b
225. Who are the "devil worshipers" ?	III	419	2 m
226. In what geologic period are found the earliest traces of trees ?	III	419	2 b
227. In what regions of the earth does a plumb-line deviate most from the vertical ?	III	419	1 m
228. The devil-fish is not a fish, nor the dragon-fly a fly. What are they ?	III	419	2 m
229. Does dew fall ?	III	497	2 b
230. What is meant by the diagnosis of a disease ; on what is it based ?	III	420	2 b
231. Dialysis is specially useful in examining animal fluids for poisons. What process is dialysis ?	III	424	1 m
232. How are diamonds split, cut, and polished ?	III	425	2 m
233. In French history, what is the story of the famous "diamond necklace" ?	III	428	2 u
234. What are diatoms ?	III	429	2 u
235. What was Dickens's first book ? His last book ? His greatest book ?	III	431	1 b
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236. Who first suggested the idea of teaching the blind to read by the sense of touch?	III	438	2 m
237. Who wrote the "Dies Ira"? "Day of wrath! On that dread day!"	III	440	2 b
238. What instrument measures a change of the 6,000th part of a degree Fahrenheit in temperature?	III	442	1 b
239. About how many pounds of the gastric juice does a healthy (human) stomach secrete daily?	III	443	2 u
240. What is meant by a dilemma?	III	444	2 b
241. What extinct bird measured 9 feet in length and whose eggs were nearly a foot long?	III	447	2 u
242. Alexander the Great once visited a philosopher and said to him, "What can I do for you?" The philosopher replied, "Cease to stand between me and the light." Who was this philosopher?	III	448	2 m
243. Who first said, "History is philosophy teaching by example"?	III	449	2 m
244. In French history, what is meant by the Directory?	III	455	2 u
245. Where is the "Dismal Swamp"?	III	459	2 b
246. Where in the U. S. do its citizens have no vote either in district or national affairs?	III	463	1 b
247. Under what circumstances, and who issued the famous order, "If any one attempts to haul down the American flag, shoot him on the spot"?	III	465	2 b
248. What was the only bird that could be sacrificed among the Jews?	III	493	2 m
249. In what nation has its dramatic writers surpassed all others, ancient or modern, in comedy?	III	499	2 m
250. When and where did the practise of "ducking," as a punishment for common scolds, originate?	III	521	2 m
251. What is meant by the "new" education?	III	588	2 m
252. Which has the greater value from the modern point of view, algebra or geography?	III	589	1 u
253. What historic country is the creation of its own main river, while the river in turn is the preserver of the country?	III	602	2 m
254. What discovery made in 1883 is of immense importance in fixing the early stages of the route of the Exodus?	III	601	1 m
255. In what country are the soil and climate such that three crops per year are grown?	III	602	2 b
256. How are the President and Vice-President of the U. S. chosen?	IV	8	1 b
257. What is the temperature of the carbon points of an arc electric light? Why is the upper point so hollowed out and the lower one pointed?	IV	10	1 m
258. How is the electric current taken from the trolley line and caused to propel a car?	IV	30	2 m
259. Who was the first to suffer the death penalty by electrocution? When and where?	IV	31	2 m
260. What are Elgin marbles? Where may they be seen?	IV	39	2 b
261. The Elizabethan age was almost unequalled in literature through the genius of what five men?	IV	42	1 m
262. What is the secret of an interesting and impressive style of delivery in speaking?	IV	48	1 b
263. What are the essential principles of effective Bible-reading in public?	IV	49	1 u
264. What is the most important document ever penned by a President of the U. S.?	IV	52	1 b
265. How is appliqué embroidery made?	IV	57	1 m
266. All animals begin their development from an ovum or egg. The history of this development of the young animal before birth constitutes what science?	IV	57	1 b
267. What gem or precious stone comes next in price to the diamond?	IV	63	1 m
268. What American poet and philosopher said, "To-day is a king in disguise"? He ignored European traditions, methods, and literary properties wherever these could be better superseded by home products.	IV	64	1 b
269. For what purpose was the Stanley expedition to Central Africa planned and executed?	IV	67	2 b
270. What is enameling, and how is cloisonné enameling done?	IV	71	1 m
271. Two of the grandest scientific truths of the century are the "correlation of forces" and the "conservation of energy." What do these expressions signify?	IV	74	2 b
272. What two great rights were secured to the English people in advance of any other people, in 1215 A. D., by the signing of the "Magna Charta"?	IV	82	2 b
273. What are the chief points of difference between the Low Church, the High Church, and the Broad Church, as applied to the Church of England?	IV	87	1 b
274. The elements of the composite English language of the present day include at least seven different languages. What are they?	IV	93	1 m
275. What were Chaucer's unrivaled characteristics as a writer?	IV	96	2 b
276. Who is considered the greatest master of English prose, and was one of the wisest of modern politicians?	IV	105	1 b
277. What English poet (1812-1890) is not only the greatest English dramatist of the age, but the greatest since Shakspeare?	IV	107	2 m
278. Who was the greatest writer of stories that ever lived?	IV	108	
279. How do insects breathe?	IV	127	1 b
280. Who invented the "Monitor" armor-clad?	IV	159	1 m
281. What people explain the phenomena of the universe by myths? Their priests can see into the land of spirits and summon the powers to consult with them in healing the sick, etc.	IV	167	2 b
282. In which book of the Bible does the name of God not occur once? Fasting is spoken of, but no mention is made of prayer.	IV	172	2 b
283. "The development of civilization has been from myth to science." What science proves this?	IV	179	1 m
284. Who is called the "Father of Geometry"? A king once asked him if there was not some easier process of learning the science than the usual one. The reply was, "There is no royal road to geometry."	IV	183	2 m
285. How is the game of euche played?	IV	183	1 b
286. What eminent American orator and statesman, through money earned by his eloquence, secured Mt. Vernon from the danger of falling into the hands of speculators and secured it as a national possession?	IV	195	2 u
287. What are the two instruments of evidence in law?	IV	197	2 m
288. What are the seven great conflicts which Christianity has had, and out of each has emerged with triumphant vindication of its claims?	IV	198	2
289. What is the theory of organic evolution? Who first placed this idea before the world in a systematic form? When?	IV	200	2 b

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291. How does Prof. J. W. Dawson show that two of the greatest exponents of the Darwinian theory of evolution—Wallace and Romanes—reason constantly in a circle, and are often inconsistent?.....	IV	208	2 b
292. How did the ancient Israelites excommunicate offenders?.....	IV	214	2 b
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294. On what hygienic grounds, aside from cleanliness, do health boards forbid expectoration in public places?.....	IV	221	2 u
295. What is dynamite? When and by whom was it invented?.....	IV	223	2 u
296. At what point in the eye is the sense of vision most perfect?.....	IV	230	1 b
297. What muscles of the face are brought into action in laughter? In weeping? In perplexity? In grief?.....	IV	235	1 b
298. Who was the first to perfect a factory in which all the processes from the raw material to the finished goods were carried out consecutively under one directing mind?.....	IV	237	2 m
299. What is the distinction between faith and belief? Between belief and knowledge?.....	IV	247	1 u
300. How may we distinguish an error or a mistake from a fallacy? All fallacies are characterized by reasoning in a circle or jumping to a conclusion. How is this shown?.....	IV	251	1 b
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302. Why is a famine in western and central Europe impossible?.....	IV	255	2 u
303. What country is the fatherland of the fan?.....	IV	257	1 m
304. Who made the great discovery of magneto-electric induction?.....	IV	258	2 u
305. The common hen may be readily hypnotized. Is it probable that serpents hypnotize birds?.....	IV	266	2 m
306. To what are the different colors on birds due?.....	IV	277	1 b
307. What is meant by a fee, or fee-simple, in property?.....	IV	280	1 b
308. What is meant by a fellowship in a college or university?.....	IV	284	2 u
309. In fencing, what is the attitude of the guard? What are the three general points where an antagonist may be attacked when on guard?.....	IV	286	1 b
310. Who were the Fenians? When and where did the first Fenian Congress meet?.....	IV	291	1 b
311. What is the distinction between fermentation, putrefaction, and decay of substances?.....	IV	295	1 b
312. Are bacteria and disease germs now considered to be animals or plants?.....	IV	300	2 b
313. What was the feudal system?.....	IV	310	2 b
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316. Of all the fine arts why is music the purest?.....	IV	341	2 u
317. What are the chief means of clarifying or fining turbid liquors?.....	IV	343	2
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320. Where are the chief herring fisheries?.....	IV	363	2 b
321. Who invented and constructed the first double-acting condensing engine, transmitting power by means of cranks? When and where was it first applied?.....	IV	375	1 b
322. A yellow flag shows a vessel to be in what condition? What is meant by "striking the flag"?.....	IV	380	1 b
323. What is the greatest flax-raising country in Europe?.....	IV	386	1 m
324. In what city and in what one of its buildings is the finest collection of pictures in the world?.....	IV	397	2 m
325. Which State of the Union has the largest floricultural business in proportion to its size? In the sale of cut flowers, which flower takes the lead?.....	IV	399	2 m
326. What is the "new process" of producing flour?.....	IV	407	2 m
327. If the green parts of leaves (the coloring matter) be dissolved in alcohol, the result is of a beautiful blood-red color. How is this explained?.....	IV	414	2 u
328. The first instance of actual flight by man was made on July 31, 1894, and the speed attained was 50 miles per hour, the lifting power of the machine being 5 tons. Who was the inventor?.....	IV	417	2 m
329. For what purpose is the fly-wheel attached to an engine?.....	IV	417	2 b
330. Why is the eastern coast of the U. S. especially subject to fogs?.....	IV	420	1 m
331. Traditions, superstitions, signs, charms, etc., handed down from generation to generation for two thousand years are explained through what modern study?.....	IV	426	2 m
332. Of animal food, in what order as to nutritive value do eggs, fish, and the flesh of animals rank?.....	IV	433	2 b
333. Remarkable work in carving, writing, painting, playing musical instruments, etc., can be performed by the foot when the hand is lacking. What is its structure that enables it to do this?.....	IV	437	2 m
334. What was the resolution introduced in the U. S. Senate in 1829 over which Daniel Webster made his celebrated reply to Hayne of South Carolina?.....	IV	439	2 m
335. What are the six great forces in Nature whose action on matter produces all material phenomena?.....	IV	442	1 m
336. Where is Fort Hancock, one of the strongest forts in the U. S.?.....	IV	461	2 b
337. By what means are geological formations in new countries identified?.....	IV	473	2 u
338. What is the effective war footing of France?.....	IV	499	2 u
339. What three forms of religious worship are recognized in France and maintained at her expense?.....	IV	501	1 u
340. "The reign of terror" in France, what was its cause? Who were its leaders? When did it begin and end? What were its results?.....	IV	503	2 m
341. What is meant by the right of "eminent domain" in a country?.....	IV	505	2 u
342. What causes freckles, and how may they be readily removed?.....	IV	529	1 m
343. Frederick the Great, King of Prussia, was condemned to death by his own father when the latter was king. What was the cause, and how was he saved?.....	IV	530	1 b

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344. There are at least a dozen points of the argument in favor of free trade as opposed to protection. What are they?	IV	539	2 b
345. In making ice-cream, what proportion of powdered ice and of common salt will cause the mercury of a thermometer to fall five degrees below zero? How is this produced?	IV	549	2 u
346. By whom and when did the French language attain a definite and fixed form with purity, clearness, and simplicity of language that at once became models, impressing upon French literature the tendency it was to follow for two hundred years, the inaugurator of French classicism?	IV	557	1 u
347. When did France cease to have a share in the colonial interests of North America?	IV	559	2 b
348. What is one great advantage that fresco-painting has over oil-painting?	IV	560	2 b
349. The total resistance of wheels to track of railroad trains on level grades under favorable conditions is from 8 to 10 lbs. per ton weight of train at all ordinary speeds. The resistance of a moving ship is 1 lb. per square foot of surface moving at 10 knots per hour. How are these facts explained?	IV	564	2 u
350. When and under what circumstances was the term "Quaker" first used as applied to a religious sect?	IV	568	1 b
351. What was the peculiar circumstance that gave to Froebel, founder of the kindergarten, the joyful conviction that there is a law which, gradually discovered and intelligently obeyed, would bring peace and harmony into the human universe?	IV	575	2 b
352. In what continent are there no frogs?	IV	576	2 m
353. How is the heating value of any fuel determined?	IV	585	1 b
354. What kind of musical composition is a fugue?	IV	586	1 b
355. What is meant by refunding a debt?	IV	590	2 b
356. What people bury their dead in a sitting posture? Who bury theirs in tree-tops?	IV	591	1 b
357. When and where did upholstered furniture come into fashion?	IV	606	1 u
358. What is the Roman Catholic doctrine of the state of man after death?	IV	609	2 u
359. When a horse is trotting upon a pavement, how many sounds are heard as made by the striking hoofs per body length of the horse? How many in the canter? How explained?	V	8	2 b
360. What physician was the highest authority in his profession for thirteen hundred years?	V	11	2 m
361. What is the origin of the well-known American oak-apple produced on the leaves of the black oak?	V	19	1 u
362. Why do some children learn to speak earlier than others?	V	73	1 m
363. What river in southern Asia is worshiped by the natives as a goddess?	V	31	1 u
364. How is coal (illuminating) gas manufactured?	V	48	1 m
365. What is the purpose or object of the grand jury? Of how many men does it consist?	V	240	1 u
366. What are the two chief uses of graphite or plumbago? Where is the great source of supply of graphite?	V	250	1 b
367. What one force controls the motions of every planet and star in the universe?	V	256	2 m
368. What is meant when we say the specific gravity of a piece of lead, for example, is 11? or that the specific gravity of cane-sugar is 1.61?	V	257	1 u
369. What single poem has given Thomas Gray a very high position in English literature?	V	258	2 u
370. How is the game of golf played?	V	198	2 b
371. The bones of what five very large species of tropical animals have been found in the rocks of Great Britain?	V	261	1 b
372. What is the motto of Great Britain?	V	265	1 m
373. The shortest track from Queenstown to Sandy Hook lightship, for example, is by "great circle sailing." What does this mean?	V	267	2 u
374. Which of the U. S. lakes has no fish in it? Why?	V	268	2 b
375. In ancient Greece, what were the chief games played by little children?	V	271	2 u
376. When and under whose leadership did Greece attain her greatest excellence in the fine arts and civilization?	V	276	2 m
377. What caused the recent (1897) war between Greece and Turkey?	V	279	1 b
378. What are the characteristic features of worship in the Greek Church as distinguished from the Roman Catholic worship?	V	281	1 m
379. What is the subject-matter of the Iliad and the Odyssey? Who is supposed to be their author?	V	286	2 b
380. Which are the heavier, on the average, boys or girls, between twelve and fourteen years of age?	V	321	1 m
381. What authority has a guardian over the person of his ward?	V	329	2 u
382. To what is the origin of the Gulf Stream due?	V	343	2 b
383. "Probably there is not one theater or circus in Great Britain or the U. S. in which there is not at least one performer of more or less Gypsy blood." Who are the Gypsies?	V	362	1 m
384. What instrument was made famous by Foucault's use of it to show to the eye the rotation of the earth?	V	365	1 b
385. What was the first daily penny newspaper ever printed? What famous journalist was one of its publishers?	V	292	2 b
386. Habits are originated through voluntary acts. How do habits finally get beyond the control of the will?	V	370	2 b
387. What is the use of the hair-spring in a watch? Four thousand hair-springs weigh an ounce.	V	380	1 b
388. Who wrote the famous story "A Man without a Country"?	V	383	1 m
389. What seaport of America has one of the finest harbors in the world, and is one of the most strongly fortified positions held by Great Britain?	V	385	1 b
390. Who is called the "Nestor" of American geology? Who was Nestor?	V	387	1 b
391. Who is called the father of the science of physiology?	VIII	406	1 b
392. What is the cause of halos around the sun and the moon?	V	388	2 b
393. Why are the fingers of different lengths?	V	390	1 b
394. Who composed the oratorio "The Messiah"? What are the two prominent characteristics of his music?	V	402	1 b
395. What is meant by the phrases "Fabian policy" and "Carrying the war into Africa"?	V	403	1 b
396. What was the Hanscatic League? When and for what purpose was it organized?	V	405	1 m
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398. Where did Longfellow get the material for forming the framework of his poem "The Golden Legend"?.....	V	433	2 b
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408. Hedonism is the doctrine that we perform all acts with happiness as the end in view. What are the arguments for and against this doctrine?.....	V	478	2 b
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411. Which are the leading hemp-producing countries of the world?.....	V	496	1 b
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413. What American statesman said in a memorable speech, "Cæsar had his Brutus, Charles I his Cromwell, and George III may profit by their example"?.....	V	503	1 m
414. Is there properly such a thing as the "coat of arms" of a family?.....	V	513	2 u
415. A botanist's collection of specimens of plants for study and reference is called an herbarium. What are the simple and explicit directions for making an herbarium?.....	V	514	1 b
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420. Who is called the father of history?.....	V	528	2 u
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433. What days are legal holidays in the U. S.? In England?.....	V	605	2 m
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449. Who, though totally blind, ascertained the life history of bees, discovering, among other things, why they hum so constantly?.....	VI	59	2 b
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455. "Nature avoids hybridity." Why?.....	VI	91	2 u
456. How is the number of horse-power a running stream of water will produce, determined?.....	VI	99	2 m
457. What substance, if taken in an overdose, will cause death as quickly as a stroke of lightning?.....	VI	101	2 m
458. What are among the earliest symptoms of hydrophobia? What are the successive stages?.....	VI	112	1 b
459. When a solid floats, what position relative to the displaced fluid does it take?.....	VI	115	2 m

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462. What bone of the body is joined to no other bone?.....	VI	123	2 b
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466. What are the best remedies for morbidity of mind and melancholia, "the blues," etc.?.....	VI	127	2 b
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468. What is the most common form of verse or meter in English poetry?.....	VI	134	1 u
469. What famous bird was allowed perfect freedom in the streets of ancient Egyptian cities?.....	VI	135	1 m
470. What Norwegian poet in 1875 began that series of realistic pictures that have made him famous as a dramatist of the first order all the world over?.....	VI	135	2 m
471. What remarkable phenomena does ice show under continued stress?.....	VI	137	2 u
472. On what island of 70,000 population can there not be found a child ten years old unable to read?.....	VI	139	1 m
473. When we use the term "idea," what four different things may the word represent?.....	VI	152	1 m
474. What is the difference between an illusion and an hallucination?.....	VI	166	2 b
475. From what countries have been our chief sources of immigration since 1820?.....	VI	175	1 u
476. Among the proofs of immortality there are five most relied upon by the popular mind. What are they?.....	VI	177	2 u
477. What were the laws of marriage among the North American Indian?.....	VI	213	1 m
478. How is vulcanite, ebonite, or hard rubber made?.....	VI	224	1 m
479. What was the size, formation, order of march, and locked or defensive order of the celebrated Macedonian phalanx?.....	VI	242	2 m
480. In what explosive is infusorial earth (formed from diatoms) a principal constituent?.....	VI	251	2 b
481. Of what and how are copying-inks, carbon, and India inks made?.....	VI	255	2 m
482. What is one of the most significant modern discoveries as to the means by which fertilization of flowers is effected?.....	VI	275	1 m
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484. When and where was the first iron produced in North America?.....	VI	346	1 m
485. In what prominent nation of to-day do the women wear no jewelry, and household plate is unknown?.....	VI	409	1 u
486. Who was the inventor of vaccination as a preventive of small-pox, receiving nearly \$200,000 in grants for it?.....	VI	424	1 b
487. What is the jetty system as applied to the mouth of the Mississippi river?.....	VI	441	1 b
488. Who founded the religious society known as the Jesuits? What did the American missions of the Jesuits embrace?.....	VI	436	1 b
489. What has been the chief cause of Jewish persecution in different lands?.....	VI	456	2 m
490. Who was Pope Joan?.....	VI	461	1 u
491. What poem (a book of the Bible) is a wonderful specimen of literary art?.....	VI	462	1 u
492. What were undoubtedly the motives that prompted Judas to betray the Lord?.....	VI	492	1 m
493. What is hanky-panky?.....	VI	498	2 b
494. What is the great national poem of Finland?.....	VI	523	1 b
495. What powerful animal uses its tail as a third hind leg?.....	VI	528	1 m
496. For what was the temple of Karnak noted?.....	VI	537	1 b
497. With the exception of the Bible, what book is the most read in Christian literature? Who was its author?.....	VI	546	2 m
498. The last one of Kepler's three immortal "laws" was worked out after seventeen years of study. What are these three laws?.....	VI	553	2 u
499. What is ceramics?.....	VI	553	2 m
500. What is the purpose of the kindergarten system of instruction, and how is it carried out through the "gifts," "occupations," etc.	VI	571	1 b; 2 b
501. How is Point d'Alençon lace made?.....	VII	9	2 b
502. "The Stone Age villages of the 'lake-dwellers' are thought to reach back at least 6,000 or 7,000 years." Who were the lake-dwellers?.....	VII	24	1 b
503. What is the chief agency that causes the formation of lakes?.....	VII	25	2 b
504. Is there any relation between the development of any language and any development of man himself out of a lower type of animal?.....	VII	61	1 u
505. Does civilization tend to increase or to decrease the number of languages and dialects?.....	VII	56	1 m
506. Who was the author of the "Nebular Hypothesis," one of the grandest conceptions of the origin of the actual cosmos (universe), as the result of the continuous action of physical laws?.....	VII	67	1 m
507. In what country and among what people do the men do all the cooking and the women all the sewing?.....	VII	67	2 b
508. A person may steal goods of which he is the general owner. How is this possible?.....	VII	72	1 u
509. What musical instrument does each person continually carry which gives three qualities of sound?.....	VII	77	1 u
510. The golden age of Latin literature may be divided into two periods, the Ciceronian and the Augustan. To which of these periods did Vergil belong? Ovid? Quintilian? Horace? Tacitus?.....	VII	86-88	...
511. Committees practically make nearly all the laws in the U. S. Congress. How is this accomplished?.....	VII	99	1 b
512. What is the first recorded instance of the use of leather?.....	VII	115	1 u
513. How is Russia leather made, and what gives it the peculiar odor?.....	VII	118	1 b
514. Who was the greatest critic of modern times, the reformer in literature, and one of the foremost liberators of the human mind for all times? Goethe said of him, "There may be as shrewd and intelligent men, but where is such a character?.....	VII	163	2 b
515. Where is the largest library now existing?.....	VII	188	1 m

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516. If the holder of a theater ticket, after taking his seat, is notified by the proprietor to leave the building, is he bound to do so?.....	VII	192	2 b
517. Of his early life, he says, "We reached our new home about the time the State came into the Union. It was a wild region, with many bears and other wild animals still in the woods. There I grew up." This man became the savior of the nation. Who was he?.....	VII	244	1 u
518. What organ, unlike any other gland in the body, is a secreting as well as an excreting organ, and forms a substance (sugar) which is delivered directly into the blood?.....	VII	271	2 u
519. In history, what is the earliest mention of a key? Where was the first lock made?.....	VII	285	1 b
520. "The mind can only act upon what is given to it from without, furnishing nothing original from itself." This philosophy laid the foundation for "sensationalism" in England and "materialism" in France. Who was this philosopher?.....	VII	288	1 u
521. What does an average size locomotive weigh?.....	VII	289	2 m
522. How does the ordinary locust, katydid, cricket, etc., produce its sounds?.....	VII	291	2 u
523. The greater longevity of women than of men is probably due to what fact?.....	VII	312	1 m
524. What celebrated Italian historian of the fifteenth and sixteenth centuries produced a work of genius, which, at once, made politics a science, and will stand forever as a masterpiece of Italian prose style?.....	VII	392	2 u
525. What is the origin of the "Mafia" society? How does it carry into effect its object?.....	VII	413	2 u
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528. How are magic squares made?.....	VII	421	1 b
529. What is the difference between a magnet and a magnetic substance?.....	VII	423	2 m
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531. The sun sends out electro-magnetic, or visible rays falling upon the earth's equator, and magnetic, or invisible rays falling upon the polar regions. What does this explain as regards the weather?.....	VII	438	1 b
532. Whose theory of magnetism is one of the latest and agrees well with the observed phenomena of magnetism?.....	VII	431	2 u
533. Where does the mahogany-tree flourish?.....	VII	442	1 b
534. What New England State was the pioneer in prohibiting the liquor traffic?.....	VII	449	1 m
535. What cereal is more generally cultivated over the whole of the U. S. than any other?.....	VII	453	1 b
536. In music, what is the difference between a major and a minor mode, interval, or key?.....	VII	453	2 m
537. What are the three classes or kinds of damage which will support an action for malicious prosecution?.....	VII	459	2 b
538. What noted scholar (English) shows that population unchecked increases in geometrical ratio, while food supply can, at best, increase only in arithmetical ratio?.....	VII	463	2 b
539. In what geological epoch are found the earliest evidences of the mammals, or milk-givers?.....	VII	467	1 u
540. What and where is the largest known cavern, or cave, in the world?.....	VII	468	1 b
541. What is the latest scientific evidence that man has inhabited the earth for at least thirty thousand years?.....	VII	469	1 m
542. What facts lead almost to a certainty that the birthplace of man was somewhere on the southern slope of the vast mountain chain which extends from the Pyrenees to the Himalayas?.....	VII	469	2 u
543. The three highest qualities of humanity are beauty, strength, and genius. Has there yet been found the connecting link between the ape and man showing these qualities?.....	VII	469	2 b
544. What canal of great importance was formally opened for traffic in England by Queen Victoria on May 21, 1894?.....	VII	474	2 m
545. To what one educator is largely due the founding of normal schools in the U. S.?.....	VII	487	1 m
546. What is the argument for manual training as an essential feature of a correct educational system?.....	VII	493	2 b
547. What is said to be the oldest map extant? Who is reputed to be the first who attempted to draw a map of the world?.....	VII	498	1 u
548. One of the most important battles ever fought occurred 490 B. C. The burned bones of its heroes were found there in 1890 A. D. What battle was it?.....	VII	502	2 m
549. Was the execution of Mary Queen of Scots justifiable?.....	VII	552	1 b
550. Where is "Mason and Dixon's line"? Why was it so called?.....	VII	556	1 u
551. The successful use of massage as a medical treatment depends upon what conditions?.....	VII	568	2 m
552. Is thought a function of nervous action? Is "materialism of life" on the increase?.....	VII	578	1 u
553. How did Maximilian cause trouble between our Government and France at the close of the American civil war?.....	VII	589	2 m
554. What generals commanded the two armies in the decisive battle of the American civil war?.....	VII	598	1 m
555. Electricity is a most valuable remedial agent in cases of sleeplessness, headache, or brain fog. What is the best method of its application in these cases?.....	VIII	5	1 u
556. What is a "medallion" carpet?.....	VIII	3	1 m
557. "We start out walking by an impulse from our will, but we continue walking quite inattentive to what our body is doing." How is the action continued?.....	VIII	9	2 b
558. What property of the nervous system seems to account for both retention in memory and effacement from memory?.....	VIII	24	1 u
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560. Of what does the "wet method" of treating ores consist in preparing metals from their ores?.....	VIII	52	2 b
561. What causes meteorites to burst on reaching our atmosphere?.....	VIII	60	1 m
562. About how many weather maps does the U. S. Weather Bureau issue per year?.....	VIII	61	1 b
563. In a cyclone, what is meant by the "eye of the storm"?.....	VIII	66	1 u
564. To whom was the term "Methodists" first applied? When and where?.....	VIII	70	1 m
565. What system of weights and measures has been adopted by largely more than half the Christian world?.....	VIII	80	1 m
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570. How is condensed milk prepared?.....	VIII	125	2 u
571. What celebrated English philosopher and logician says of himself, "I have been told that I began to read Greek when I was three years old." "I am one of the very few examples in this country of one who has not thrown off religious belief, but never had it".....	VIII	127	2 b
572. Millet was one of the greatest artists of modern times. Is the "Angelus" now considered his masterpiece?.....	VIII	131	1 u
573. What general principle (explained by psychology) produces the universal tendency for people to act, believe, think, dress, etc., as custom, habit, and social life dictate?.....	VIII	136	1 u
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767. What important cereal of the grass family was introduced into China by India in 2822 B. C.? It forms the food of much of the human race.	X	99	1 u
768. What French statesman and cardinal overthrew the feudal power of the nobility, lived among conspirators, yet punished them with merciless severity, and even overawed the king, Louis XI himself?.....	X	102	2 b
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771. The natural history of a river proves that it passes through several life stages; it has a birth, childhood, youth, maturity, and old age. How are these facts ascertained?.....	X	121	1
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785. What causes apples, plums, peaches, potatoes, tomatoes, etc., to rot?	X	191	1 m
786. Who was the first Jew admitted to Parliament in England? When?	X	192	1 b
787. What was at the basis of his ideas and his philosophy that made Rousseau's influence upon his country and Europe difficult to be overestimated?	X	198	1 m
788. What is the Courtney stroke in rowing?	X	200	2 m
789. What are Rubens's two masterpieces in painting?	X	202	1 b
790. What famous art critic is also one of the great modern masters of English prose, especially in imaginative and poetic description? How has his influence as a thinker been impaired?	X	211	2 m
791. Who is the present monarch of the largest empire in the world?	X	627	2 b
792. Which day of the week is the first day? Why celebrated? On what condition did the reformer Martin Luther suggest that people might dance, work, etc., on the Sabbath day?	X	231	1 u
793. On what principle is the safety-lamp for miners constructed?	X	238	2 m
794. Where is the largest desert in the world? What causes its aridity?	X	242	2 b
795. In buying and selling, what are the legal duties and remedies of both buyer and seller?	X	264	2 m; 2 b
796. In what army are women eligible to any position as its officers?	X	279	2 b
797. By what means is glass engraved and ornamented?	X	288	2 m
798. What is the highest and most interesting mountain in Arizona? From its summit, one can look down into the throats of more than 100 extinct volcanoes.	X	293	1 b
799. What literature is the oldest literary monument of our part of the human race?	X	301	1 m
800. Who were the Saracens?	X	313	1 b
801. According to the highest recent authorities, what is the nature and structure of the planet Saturn's rings?	X	321	1 b
802. In nearly every instance, what is the cause of the failure of savings banks?	X	327	1 b
803. Where were saw-mills first employed for cutting lumber? Why were they violently opposed in England? Where first located in America?	X	329	2 m
804. What myth relating to the world ash-tree is one of the most poetic and significant myths in Scandinavian mythology?	X	339	1 b
805. On what grounds is skepticism declared to be a necessary preparation to philosophic thinking, i. e., we must doubt before we can clearly think?	X	341	2 b
806. Two of the greatest German poets discovered unexpected points of sympathy in each other, after which they became united in a personal and literary friendship noble as it is rare in history. Who were these poets?	X	348	1 b
807. What eminent German theologian and philosopher of the eighteenth and nineteenth centuries, insisted that "Religion is not a knowing nor a doing, but a feeling of dependence"?	X	350	1 b
808. Through what educational agency arose the first general intellectual movement of modern Europe? Who was the first in Europe to advocate the establishment of schools for the masses?	X	357	1 b; 2 m
809. What nation as early as 500 B. C. had divisions in the education of its youth corresponding to the three divisions of modern times, viz., primary, secondary, and higher education?	X	361	1 m
810. On what grounds have normal schools any inherent right to exist? What is the real function of the normal school?	X	363	1 m; 1 b
811. What are the recent requirements for admission to medical schools in the State of New York?	X	368	1 b
812. What is the inductive, or case method, of studying law as now employed in nearly every law school in this country? By whom and when was the method introduced?	X	371	1 u
813. On what theory of matter is the curative system of "Christian Science" based? Who discovered the principle underlying the method?	X	381	2 b
814. During the sixteenth century, what Protestant Church was the richest in Christendom, owning one half the real estate of the country? What was the cause of this?	X	389	1 b
815. Said a great poet and novelist, years after he had become famous: "It is with the deepest regret that I recollect in my manhood the opportunities which I neglected in my youth. Through every part of my literary career I have felt pinched and hampered by my own ignorance; and I would at this moment give half the reputation I have had the good fortune to acquire, if by doing so I could rest the remaining part upon a sound foundation of learning." Who was this poet?	X	392	1 m
816. By what simple method were screw-threads cut at first? What is one of the chief uses of the screw?	X	395	1 m
817. What is the modern method by which the sculptor produces his work? What was Michelangelo's method?	X	397	2 m
818. How did the use of the seal as a device for authenticating important written instruments originate?	X	401	2 u
819. Where is the principal seat of the hair-seal fishery?	X	402	2 u
820. What is the probable cause of seasickness? What are the remedies?	X	405	2 b
821. In 1844 it was declared by a commission from the Academy of Sciences of Paris that up to 1837 idiots could not be educated nor cured by any means previously known or practiced. Who did solve the problem in 1837?	X	413	1 b
822. By means of what instrument are the motions of a point on the earth's surface during an earthquake recorded so that afterward they may be studied?	X	414	2 m
823. What is the explanation of this fact in infancy: A child separated from his mother loses a part of himself, as much so as to be separated from a hand or foot?	X	417	2 b
824. Why does cold water feel colder, if the hand is just from warm water?	X	425	2 m
825. "No other writer ever united imagination, fancy, humor, knowledge of human nature, worldly wisdom, psychological insight, and creative power. He does not hesitate to show us that even both good and bad may, and often do, act from motives good and evil." Who was this genius?	X	457	1 b
826. What nation was probably the first ship-builders?	X	478	2 m
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847. Why are smokeless powders smokeless?.....	X	585	2 m
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